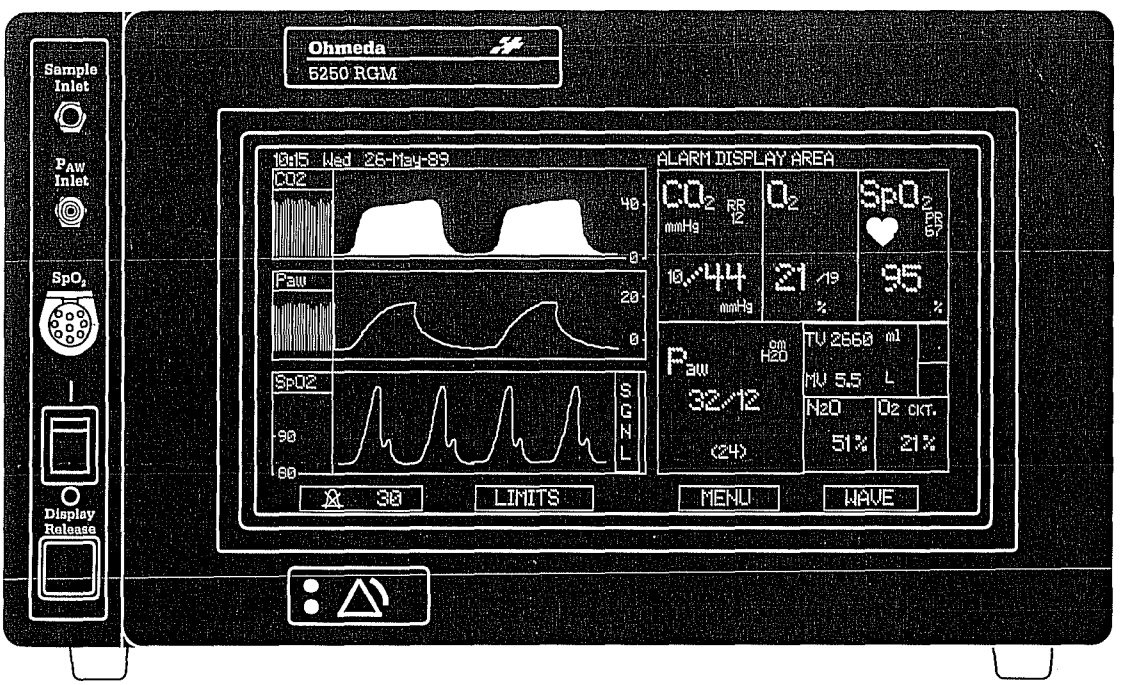
5250 Respiratory Gas Monitor

Operation and Maintenance Manual



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Critical Care

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User Responsibility

This Product will perform in conformity with the description contained in this operating manual and accompanying labels and/or inserts, when assembled, operated, maintained, and repaired in accordance with the instructions provided.

This Product must be checked periodically. A defective Product should not be used. Parts that are broken, missing, plainly worn, distorted, or contaminated should be replaced immediately. Should such repair or replacement become necessary, Ohmeda recommends that a telephone or written request for service advice be made to the nearest Ohmeda Regional Service Center.

This Product or any of its parts should not be repaired other than in accordance with written instructions provided by Ohmeda and by Ohmeda trained personnel. The Product must not be altered without the prior written approval of Ohmeda's Safety Department. The user of this Product shall have the sole responsibility for any malfunction that results from improper use, faulty maintenance, improper repair, damage, or alteration by anyone other than Ohmeda.

CAUTION: Federal law in the USA and Canada restricts this device to sale by or on the order of a licensed medical practitioner.

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this manual:

- Warnings alert the user to potential product use or misuse that could harm the user or others.
- Cautions alert the user to potential product use or misuse that could harm the product, associated equipment, or the surrounding environment.

The warnings and cautions that appear in the text of this manual are described in the following sections.

⚠ Warnings

The Ohmeda 5250 Respiratory Gas Monitor (RGM) does NOT have the ability to identify anesthetic agents. If the agent selected on the monitor is not the agent delivered to the patient circuit, the values will be inaccurate. If a mixture of anesthetic agent is delivered, the monitor may not indicate accurate values.

In the presence of alcohols, ketones, or other organic hydrocarbon vapors, the 5250 RGM will not indicate accurate readings of anesthetic agent. This includes their presence not only in the sample line or patient circuit, but also ethyl alcohol present in a patient's bloodstream.

Handle the 5250 RGM with care. Damage to the RGM or inaccurate operation may result from improper handling.

Do not operate the 5250 RGM unless it is properly calibrated. Inaccurate patient parameter readings will result.

Keep the circuit O_2 sensor attached to the unit to assure accuracy of O_2 readings. If detached, the sensor must be reattached and stabilized for an equivalent length of time (up to a maximum of 14 hours) before recalibrating.

If the RGM fails to respond as described in the calibration procedure, do not use that portion of the monitor until the malfunction is corrected.

For the 5250 RGM without Agent, use only Ohmeda calibration gas or calibration gas of 6% CO_2, 50% O_2, and 44% N_2O (±0.05 volume % gravimetric standard). For the 5250 RGM with Agent, use only Ohmeda calibration gas of 4% halocarbon-22, 6% CO_2, 40% N_2O, and 50% O_2. Refer to Section 6.1 to order calibration gas.

SpO_2 data is NOT collected when electrosurgical interference is detected. If long periods of interference exist, the values for SpO_2 and pulse rate are shown as dashes.

Use only Ohmeda probes with Ohmeda oximeters and monitors; otherwise, patient injury or equipment damage may result.

Patient Safety–Exercise extreme care to assure continued circulation distal to the probe site after application.

Patient Safety–Prolonged monitoring or patient condition may require changing the probe test site periodically. Change the probe site at least every four hours to reduce the risk of blistering, skin erosion, or ischemic skin necrosis (especially if the site is poorly perfused).

Do not place the airway pressure adapter on the expiratory check valve of the absorber. Blockages in the tubing circuit can cause high patient airway pressures and may not be detected by the RGM.

The Minute Volume and Tidal Volume alarms are usable only if the TVX flow cartridge is installed in the correct section of the breathing circuit. Operate the 5250 RGM only with the TVX flow cartridge placed in the expiratory limb or common airway of the breathing circuit. If the flow sensor is placed in the inspiratory limb, the RGM will not provide exhaled volume data.

If the 5250 RGM is used with a hanging bellows type anesthesia ventilator, the monitor may register volumes in spite of circuit disconnection.

Water in the TVX flow cartridge will restrict the motion of its internal vanes and cause erroneous tidal volume and minute volume readings. Position the tubing so that water drains away from the cartridge and does not accumulate in it.

Exposure of the sensor clip to a direct beam of light may cause erroneous tidal volume and minute volume readings. Shield the sensor clip with opaque material if the reading is suspect.

Distal Mounting: When placing the TVX flow cartridge on the absorber valve, be certain to obtain a secure fit, but do not force the cartridge in place as tightly as possible. Because the sensor cartridge is tapered, a secure fit can be achieved without excessive force.

A properly placed cartridge is removable by hand, but it is advisable that a tool (pliers or channel lock pliers) be available to remove the cartridge in case it has been jammed on too tightly.

Before every use, ensure that the TVX flow cartridge is operational and easily removable.

The flow sensor must be correctly oriented in the breathing circuit as indicated by the markings on the sensor clip. The arrows should point away from the patient. If the clip is not mounted correctly, the volume monitor will not operate properly.

Precautions

The circuit O_2 display and alarms are only usable if enabled on the Setup Screen and a calibrated circuit O_2 sensor is installed. The RGM must be calibrated for the currently installed O_2 sensor.

Do not insert the circuit O_2 plug into the flow sensor connector on the back of the machine. Damage to the monitor could result.

Perform the checkout procedure in Section 5.1 before using the monitor on a patient. If the monitor fails any test, it must be removed from use until it has been repaired and checked for correct operation.

Do not block airflow from the air intake or exhaust vents. Inaccurate readings and/or damage to the RGM may result. Do not place the RGM on surfaces with above ambient temperatures.

The presence of nebulized agents in the sample gas, such as Mucomyst (Registered trademark of Bristol-Myers), may over extended periods of exposure, tend to obstruct internal RGM filters.

Do NOT use the 5250 RGM in the presence of flammable anesthetics.

Do not remove the cover of the RGM. Refer servicing to qualified service personnel. Service personnel should disconnect the power cord before servicing the RGM.

For continued protection against fire hazard, replace only with the same type and rating of fuse.

⚠ Cautions

Use only the 8-foot sample tube assembly supplied with the monitor. A longer tube may change the operating characteristics (specifications) of the monitor, such as degrade the response time. Order replacement sample tubes as listed in Section 6.1.

Avoid storing the monitor and probes at temperatures outside the following range: -20° to 60° C (-4° to 140° F).

When attaching the display panel, ensure that both the top and the bottom of the display panel are fully seated into their slides. Failure to fully seat the display panel may allow the display panel to fall off and be damaged.

Empty the fluid trap before each patient or whenever the trap is more than half full. Failure to empty the trap may allow it to fill while monitoring a patient and cause the monitor to stop sampling gas.

Make sure the monitor voltage selected agrees with the local voltage available.

Do not cover or block the cooling fan.

Connect only a high input inpedance device (10K ohm or higher) to the analog output connector. Improper loading will upset the correspondence between the measured voltage and the intended output voltage.

Use only the power cord supplied with the RGM. When replacing the power cord, use only the power cord specified for this RGM.

Pressure in excess of 10 psi above atmospheric could damage the P_{AW} inlet or sample inlet to the RGM.

Avoid storing O_2 sensors outside the following range: 0° to 26° C (32° to 80° F). O_2 sensors must have shorting clips or be connected to the monitor when in storage or not in use.

When in use, the circuit O_2 sensor should always be facing downward to reduce moisture buildup on its sensing surface.

Do NOT autoclave or pressure sterilize the 5250 Respiratory Gas Monitor.

Do NOT gas sterilize the 5250 RGM.

Never immerse the RGM in liquid. The electronic circuitry can be short-circuited, causing permanent damage.

Use the cleaning solution sparingly. Do NOT saturate the RGM. Excessive solution can flow into the RGM causing damage to internal components.

Following sterilization of the patient circuit oxygen probe housing (front half only) or the tee manifold with ethylene oxide, quarantine parts to allow dissipation of residual ethylene oxide gas absorbed by the material. Follow sterilizer manufacturer's recommendations for procedure and aeration period.

After sterilization with ethylene oxide, the flow sensor should be quarantined in a well ventilated area to allow dissipation of residual ethylene oxide gas absorbed by the probe. Follow the sterilizer manufacturer's recommendations for specific aeration periods required.

Never insert cleaning brushes or other foreign objects through the flow cartridge vanes. The precision movement may be damaged.

Following flow cartridge sterilization with ethylene oxide, quarantine the cartridge in a well ventilated area to allow dissipation of residual ethylene oxide gas absorbed by the cartridge material. Follow the manufacturer's recommendations for specific aeration periods required. In some cases, aeration periods of seven days or more may be required.

Use the recommended cleaning solution sparingly; do not saturate or immerse the flow sensor clip.

Do not attempt to clean the sample chamber of an RGM with Agent. Cleaning may cause permanent damage to the sensor and void the warranty.

Follow the sterilizer manufacturer's recommendations concerning procedures and aeration periods.

Maximum voltage. No more than 5 volts should appear on any pin of the analog output connector.

Do not use a strong alkaline detergent to clean the sample chamber because alkaline detergent may corrode the aluminum casing.

Only competent individuals trained in the repair of this equipment should attempt to service it.

Detailed information for more extensive repairs is included in the service manual solely for the convenience of users having proper knowledge, tools, and test equipment, and for service representatives trained by Ohmeda.

After replacing the internal O_2 sensor, perform the calibration procedure in Section 3.1 to verify the RGM is working properly. Allow at least five minutes for the sensor to stabilize before calibrating.

After replacing the probe assembly, perform the calibration procedure in Section 3.2 to verify that the RGM is working properly. Allow at least five minutes for the sensor to stabilize before calibrating.

After replacing the sensor cartridge, perform the O_2 sensor calibration in Section 3.2 to verify that the RGM is working properly. Allow at least five minutes for the sensor to stabilize before calibrating.

Never tamper with the set screws in the flow cartridge. Such action will render the cartridge unusable.

Malfunctioning flow cartridges must be destroyed to prevent their inadvertent use.

Notes

This manual describes the proper preparation, operation, and maintenance of the Ohmeda 5250 Respiratory Gas Monitor (RGM). Read through the entire manual, with an RGM available for hands-on experience, before using the RGM with a patient. Pay special attention to the warnings and cautions, which appear throughout the manual and are listed in the "Precautions" section.

Read the user responsibility statement; it describes what is expected of the user to maintain a safe and accurate instrument. Read the warranty; it describes Ohmeda's responsibility in case of a functional defect.

Keep this manual available for answering questions that may arise concerning the monitor's operation, its maintenance, or in case of failure, its repair. The maintenance procedures in this manual can be performed by the operator.

Always handle the RGM and accessories with care to prevent physical damage to the equipment or inaccurate operation.

The 5250 RGM can be ordered with a number of options. Check the packing slip against the invoice to ensure you have received what was ordered. If possible, save the packaging materials for shipping or storing the monitor.

Section 2 describes the controls and connectors for the monitor and the software program used for the setup and operation of the monitor.

Section 3 explains how to calibrate the monitor before using it with a patient.

Section 4 describes how to connect the patient to the RGM for the parameters you are monitoring.

Section 5 details a preoperative checkout procedure that must be performed before the RGM is used with a patient. The monitor operation procedure summarizes the steps required of the operator before starting to monitor a patient.

Section 6 lists the accessories and the specifications for the 5250 RGM.

Section 7 explains how to clean and sterilize the 5250 RGM and accessories.

Section 8 details how to perform routine operator maintenance on the 5250 RGM and tells you what to do if the monitor is not working properly.

The Appendix has information that you may need to refer to occasionally and information about the 78xx ventilator interface.

The software features and functions described in this manual apply to Rev 3.00 or greater of the display processor. The Service Screen shows your current revision level.

This manual covers the following 5250 Respiratory Gas Monitors:

Basic RGM **6051-0000-009**
(Includes CO_2, O_2, N_2O, Airway Pressure, Tidal and Minute Volume, Resp. Rate, and Circuit O_2)

Basic RGM with SpO_2 and Pulse Rate **6051-0000-010**

Basic RGM with Agent **6051-0000-011**

Basic RGM with Agent, SpO_2, and Pulse Rate **6051-0000-012**

Notes

2.1 General

The Ohmeda 5250 Respiratory Gas Monitor (RGM) provides in one compact package a total respiratory monitoring solution for the operating room or intensive care unit.

The RGM uses microprocessor technology to measure CO_2, O_2, N_2O, and airway pressure. Airway flow, anesthetic agent, SpO_2, and patient circuit O_2 are monitoring options. All of these parameters are displayed on a 4" by 8" flat electroluminescent display screen and are integrated with an alarm management system. The monitor is controlled by infrared touch controls, and the display is removable for easy access and viewing.

A kit included with the monitor contains a pressure sensing tee, patient sample catheters, airway adapters, a sample chamber cleaning kit (5250 RGMs without Agent), and calibration gas. Optional accessories allow the monitoring of patient circuit O_2 and airway flow. The SpO_2 and anesthetic agent monitoring options may be either ordered factory installed or added later by Ohmeda service representatives.

The computer program cartridges are accessible through the rear panel of the main unit and through the side panel of the display, which makes software upgrades and future options simple to install.

The RGM features auto-zeroing and an easy calibration procedure.

An RS-232 interface provides communication to a printer, computer, or to an Ohmeda 78xx ventilator.

Note: The "xx" in 78xx represents a variable, because there are 7800 and 7810 ventilators in use.

Seven analog output channels are available on the rear panel for connection to a strip chart recorder.

2.2 Front Panel Controls and Connectors

Refer to Figure 2-1.

Sample Inlet

The sample inlet connects the patient circuit to the RGM via a small diameter gas sampling tube. The connector accepts a male luer lock fitting.

CAUTION: Use only the 8-foot sample tube assembly supplied with the monitor. A longer tube may change the operating characteristics (specifications) of the monitor, such as degrade the response time. Order replacement sample tubes as listed in Section 6.1.

PAW Inlet

The PAW inlet allows attachment of the pressure sensing tube from the patient circuit to the RGM.

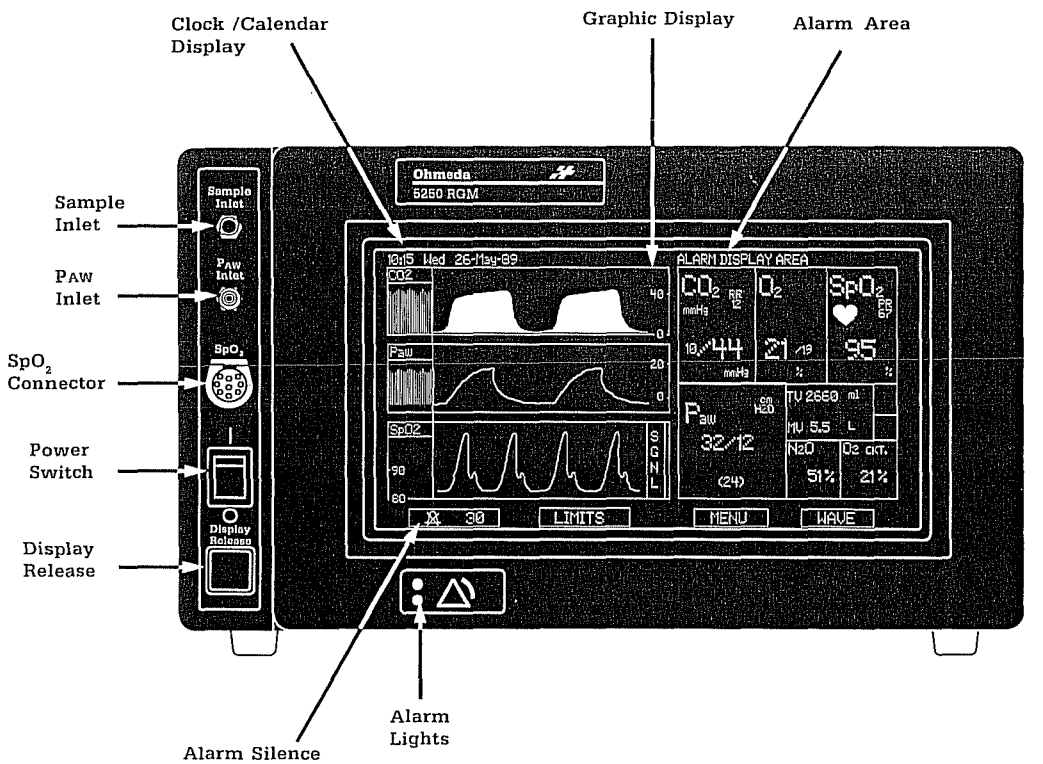


Figure 2-1
5250 RGM Front Panel

SpO_2 Connector

The SpO_2 connector allows attachment of the nine-pin oximeter probe to the RGM.

CAUTION: Use ONLY the Ohmeda SpO_2 probes supplied for this 5250 RGM model. Check the Identification Number/Serial Number tag, which is located on the cable near the connector. The model number must read: MOD 8122-00x or 8121-00x (x represents a digit from 1 through 7).

Power Switch

The power switch turns AC power to the RGM On (I) or Off (O).

Display Release

Depress this button to slide the display to the right and permit observation of the water trap or to remove the display from the chassis. The display has an 8-foot extension cord attached.

To remove the display from the RGM, press the Display Release push button and slide the display to the right until the alignment marks, in the trap area and on the upper right side of the display, line up as shown in Figure 2-2. Gently lift the display straight up and pull the bottom away from the chassis as shown in Figure 2-3.

To attach the display to the RGM, first coil the cord in the cord storage box, insert the top of the display, position the alignment marks at the top, and gently push the bottom towards the chassis. Slide the display to the left until the latch clicks.

CAUTION: When attaching the display, ensure that both the top and the bottom of the display are fully seated into their slides. Failure to fully seat the display may allow the display to fall off and be damaged.

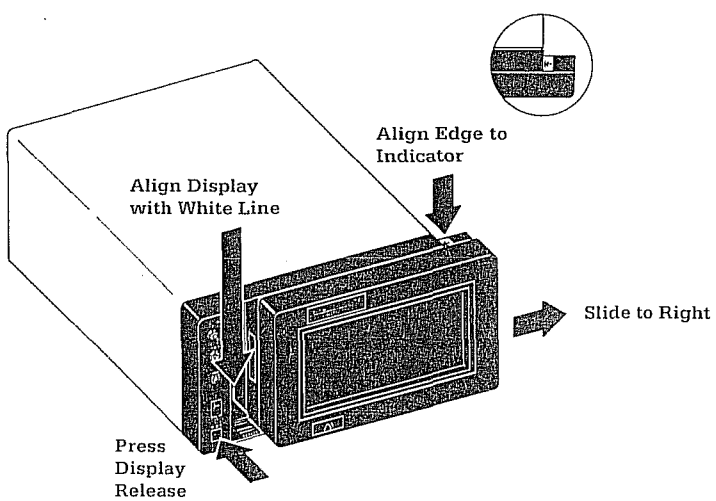


Figure 2-2
Display Release

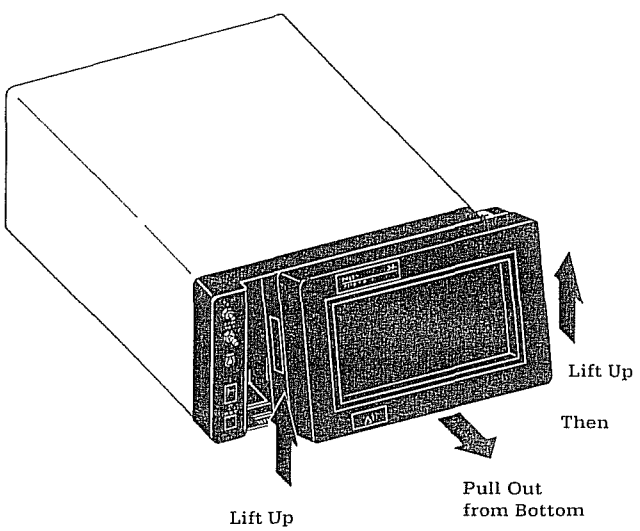


Figure 2-3

Fluid Trap

The fluid trap, located behind the display, collects fluids separated from the aspirated patient sample. To remove the trap bottle for emptying, pull the bottle straight down. The O-rings can be lubricated with lubricant, such as Vac Kote[1] or Cello Seal[2], which are specified safe for use in an oxygen enriched environment. To replace the bottle push the bottle into position.

CAUTION: Empty the fluid trap before each patient or whenever the trap is more than half full. Failure to empty the trap may allow it to fill while monitoring a patient and cause the monitor to stop sampling gas.

Sample Filter Cartridge

Some units have a gas sample filter cartridge (Figure 2-4) located above the fluid trap. Replace this filter cartridge when the advisory message SAMPLE FILTER BLOCKED appears in the alarm display area or when the CO_2 waveform response time is degraded.

To remove the cartridge, pull it straight out from the fluid trap assembly. To replace the cartridge, place it in position and slide it in until it seats properly. Check for leaks by occluding the sample inlet and noting that the unit purges within five seconds.

Graphic Display

The entire graphic display is covered by a matrix of infrared targets. A control is displayed as an option on a screen. Simply touch the option to activate the control. It is not necessary to exert pressure on the screen since the infrared beam is broken when a finger nears the option.

Clock/Calendar Display

The clock/calendar display area, located on the top left side of the display screen, indicates the time of day (24-hour clock) in hours and minutes, the day of the week, the day of the month, the month of the year, and the year.

To set the clock/calendar:

1. Select MENU from the display screen.
2. Select SETUP from the menu.
3. Select CLOCK SET from the Setup Screen.

Time and date changes can then be made on the screens displayed. The clock/calendar will maintain the current time and date when the power is switched off.

Note: Some older monitors do not have hardware to support the clock/calendar. On these monitors, no clock appears on the main screen and no clock set option is available.

Alarm Area

The alarm area indicates alarm messages on the top right side of the display.

Alarm Lights

The alarm lights display either a flashing red light, a flashing yellow light, or a continuous yellow light depending on the type of alarm. Refer to "Alarm Types" in Section 2.8.

1.Vac Kote is a registered trademark of the Ball Corporation.
2.Cello-Seal is a registered trademark of Fisher Scientific.

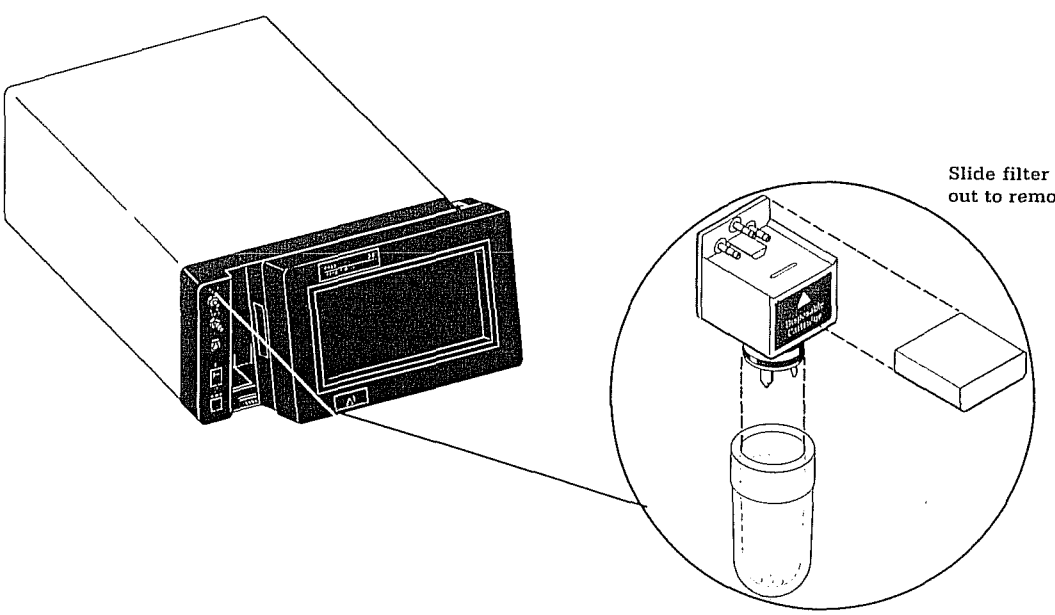


Figure 2-4
Sample Filter Cartridge Replacement

Alarm Silence

The Alarm Silence function is an infrared touch function located in the lower left corner of the monitoring screen. Touching this area mutes the audio for the indicated length of time.

A new alarm during this mute period resets the Alarm Silence and allows the audio alarm to sound. An additional touch during the mute period will reset the Alarm Silence and allow a new audio alarm.

A double touch of an inactive alarm, within two seconds, will cause the ALL MUTE message to appear next to the alarm silence area, and new alarms will not activate the audio sound for the alarm silence interval. A third touch of alarm silence within two seconds will put the unit into permanent all mute mode, which mutes all alarms except LOW INSPIRED O_2.

Another touch resets the alarm mode. The alarm silence interval can be changed on the Setup Screen.

Note: If the 78xx ventilator interface is being used, the mute period is limited to 30 seconds. The All Mute function is inhibited if the 78xx ventilator is selected as the RS-232 device on the Setup Screen. A second touch clears alarm silence.

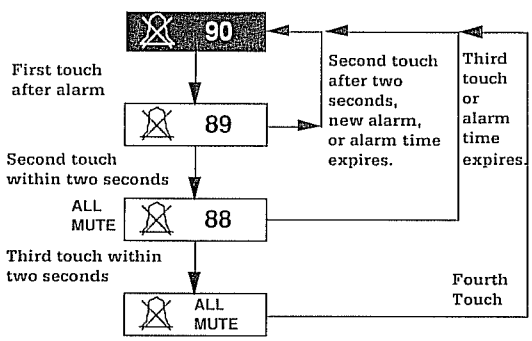
2.3 Back Panel Controls and Connectors

Refer to Figure 2-5.

Voltage Selector

The voltage selector switch allows the operator to match the available local voltage to the monitor. Voltage selections include 100V, 120V, 220V, and 240V. Once the switch is properly adjusted no further resetting should be required.

CAUTION: Make sure the monitor voltage selected agrees with the local voltage available.



Alarm Silence Diagram

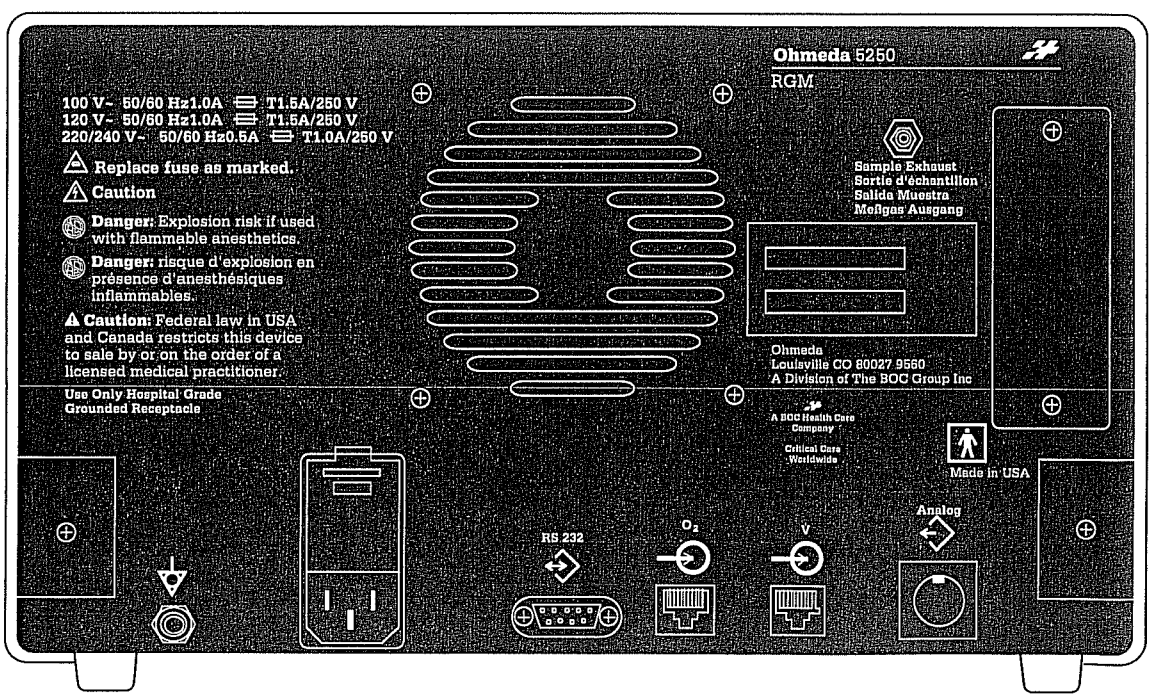

Ohmeda 5250
RGM
100 V~ 50/60 Hz1.0A T1.5A/250 V
120 V~ 50/60 Hz1.0A T1.5A/250 V
220/240 V~ 50/60 Hz0.5A T1.0A/250 V
Replace fuse as marked.
Caution
Danger: Explosion risk if used with flammable anesthetics.
Danger: risque d'explosion en présence d'anesthésiques inflammables.
Caution: Federal law in USA and Canada restricts this device to sale by or on the order of a licensed medical practitioner.
Use Only Hospital Grade Grounded Receptacle
Sample Exhaust
Sortie d'échantillon
Salida Muestra
Meßgas Ausgang
Ohmeda
Louisville CO 80027 9560
A Division of The BOC Group Inc
A BOC Health Care Company
Critical Care Worldwide
Made in USA
Analog
RS 232
O_2
V

Figure 2-5

Cooling Fan

The cooling fan provides constant air circulation for the RGM to protect heat sensitive electronic components.

CAUTION: Do not cover or block the cooling fan.

Sample Exhaust

Connect the sample exhaust line (1/8" barbed connector) to a waste gas scavenging system to properly eliminate the gas sample. If a closed circuit is required, return the gas sample to the patient circuit.

Software Module

The RGM's program is stored in the software module. Contact Ohmeda Customer Service as listed on the back page to obtain the latest software upgrade. For software module replacement, refer to Section 8.4.

External Ground Connection

The external ground connection allows equipotential grounding for the monitor when required.

Power Cord Receptacle

The power cord receptacle allows the monitor to be connected to the local power system.

CAUTION: Use only the power cord supplied with the RGM. When replacing the power cord, use only the power cord specified for this RGM.

RS-232 Connection

The nine-pin isolated RS-232 connector provides printer, computer, or 78xx ventilator interface.

O_2 Sensor Input

The O_2 sensor input provides the connection for the O_2 sensor to the 8-pin modular jack on the RGM. When inserting the plug, be certain that the connector plug is fully seated in the jack and a locking click is heard during insertion. A slight tug on the cord will ensure that the plug is fully seated.

Flow Sensor Input

The flow sensor input provides the connection for the flow sensor to the 6-pin or 8-pin modular jack on the RGM. When inserting the plug, be certain that the connector plug is fully seated in the jack and a locking click is heard during insertion. A slight tug on the cord will ensure that the plug is fully seated.

Analog Output

The analog output provides an analog signal proportional to the real-time N_2O waveform, CO_2 waveform, and other values. The 8-pin DIN analog output connector provides 0 to 1V full-scale sensitivity with approximately a 100-ohm source impedance (see "Connector Pinouts" in Section F of the Appendix).

CAUTION: Connect only a high input impedance device (10K ohm or higher) to the analog output connector. Improper loading will upset the correspondence between the measured voltage and the intended output voltage.

2.4 Displays

A. CO_2 Displays

Refer to Figures 2-6 and 2-7.

CO_2 Digital Display

The previous breaths inspired value is displayed to the left of the slash (/) and the maximum end tidal CO_2 value over the last three breaths is displayed to the right of the slash. The selected unit of measure (%, kPa, or mmHg) is displayed at the bottom right of the display. The respiratory rate (RR), derived from CO_2 values, is displayed near the top right.

Note: 0-15% is approximately in the 0-110 mmHg range at sea level. The mmHg and kPa ranges are dependent upon local barometric pressure.

CO_2 Waveform and Trend Display

The capnogram is displayed with a scale on the right side. Seventy minutes of end tidal and inspired trend at one point every two minutes are displayed to the left of the capnogram. The average inspired and expired values for each two-minute period is displayed in the trend area.

CO_2 Trend Display

Eight hours of end tidal trend data at one point every two minutes are displayed. The available display ranges are 0-20, 0-40 (default), or 0-80 mmHg; 0-2.5, 0-5, or 0-10%; 0-3, 0-6, or 0-12 kPa.

CO_2 Breath-by-Breath Trend Display

If selected on the Setup Screen, a 200-breath trend of inspired and expired values is displayed. Tick marks denote five-minute intervals in this trend.

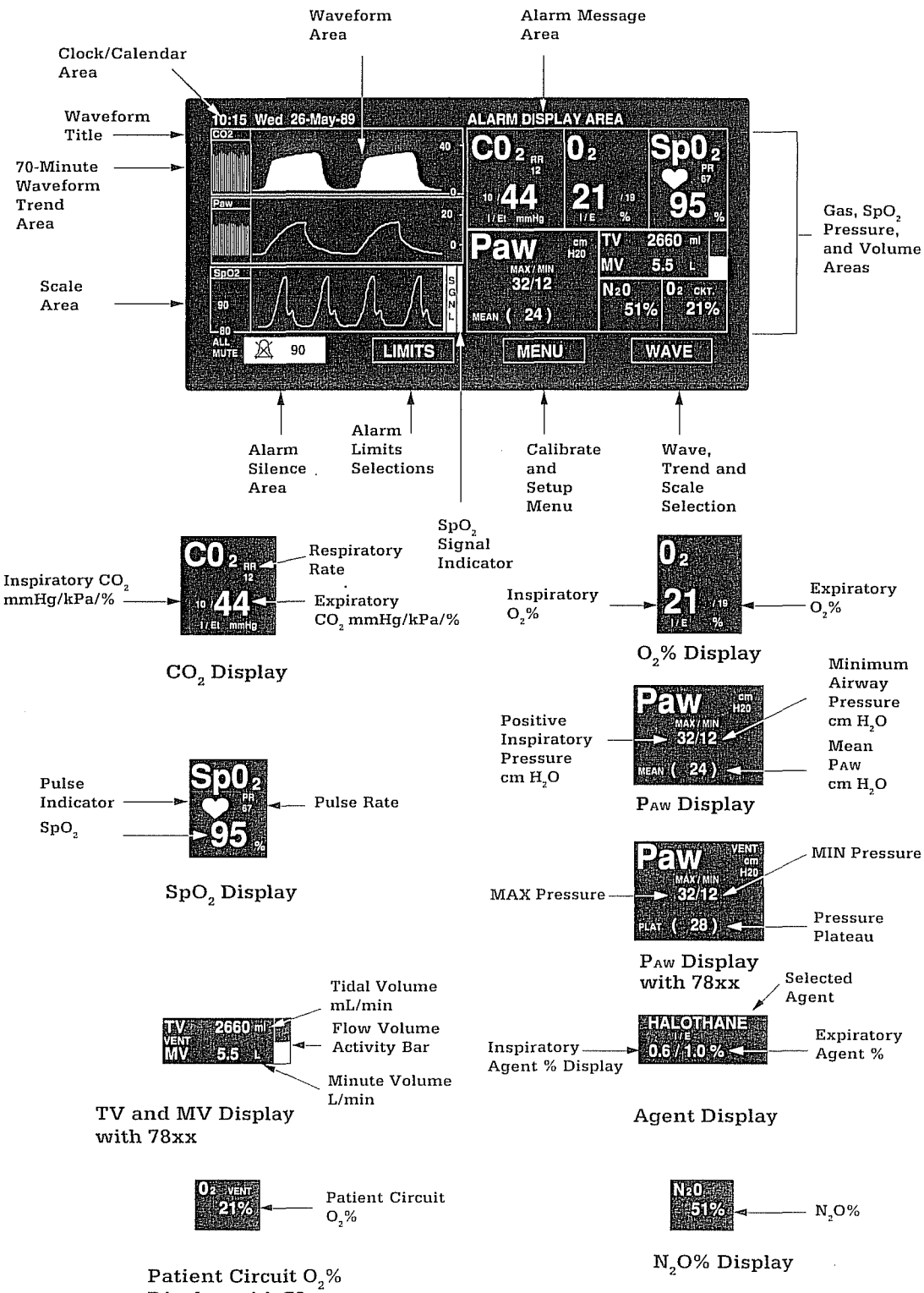
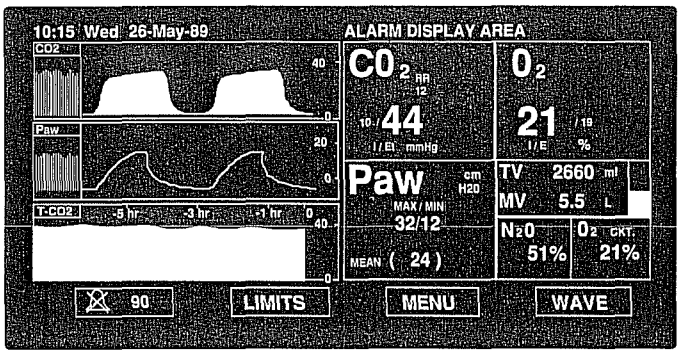
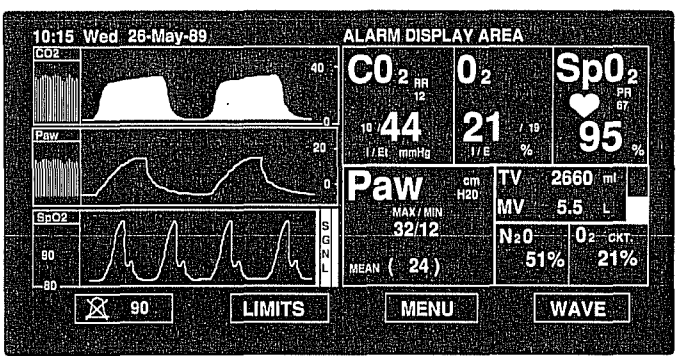

Waveform Area
Alarm Message Area
Clock/Calendar Area
Waveform Title
70-Minute Waveform Trend Area
Scale Area
Gas, SpO2 Pressure, and Volume Areas
10:15 Wed 26-May-89
ALARM DISPLAY AREA
CO2
Paw
SpO2
ALL MUTE
90
LIMITS
MENU
WAVE
Alarm Silence Area
Alarm Limits Selections
Calibrate and Setup Menu
Wave, Trend and Scale Selection
SpO2 Signal Indicator
Inspiratory CO2 mmHg/kPa/%
Respiratory Rate
Expiratory CO2 mmHg/kPa/%
CO2 Display
Inspiratory O2%
Expiratory O2%
O2% Display
Pulse Indicator
SpO2
Pulse Rate
SpO2 Display
Positive Inspiratory Pressure cm H2O
Minimum Airway Pressure cm H2O
Mean PAW cm H2O
PAW Display
MAX Pressure
MIN Pressure
Pressure Plateau
PAW Display with 78xx
Tidal Volume mL/min
Flow Volume Activity Bar
Minute Volume L/min
TV and MV Display with 78xx
Selected Agent
Inspiratory Agent % Display
Expiratory Agent %
Agent Display
Patient Circuit O2%
Patient Circuit O2% Display with 78xx
N2O%
N2O% Display

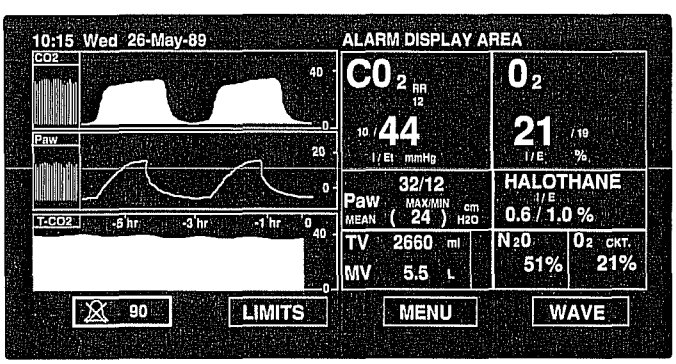
Figure 2-6



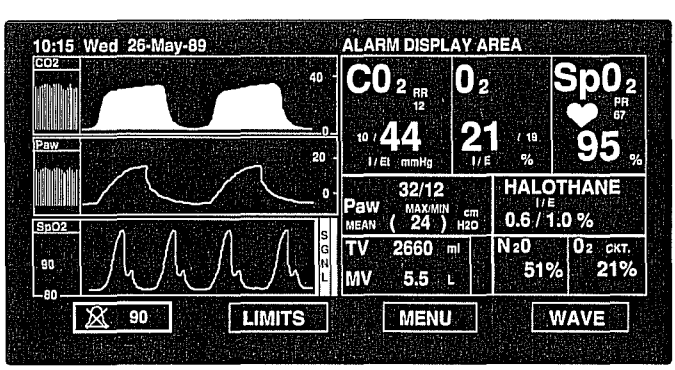
Non-agent Analyzer



Non-agent Analyzer with SpO_2 Option



Agent Gas Analyzer Only



Agent Gas Analyzer with SpO_2

Figure 2-7
5250 RGM Display Versions

Note: All display screens show optional flow sensor and optional patient circuit O_2 sensor installed.

CO_2 Alarms

Alarm Message	Default	Range	Type
HIGH Et CO_2	OFF	OFF, 0-15%	Emergency
LOW Et CO_2	OFF	OFF, 0-15%	Emergency
CO_2 APNEA	30 sec	20-30 sec	Emergency
HIGH Fi CO_2	OFF	OFF, 0-15%	Emergency

B. O_2 Displays

O_2 Digital Display

Inspired and expired O_2 are measured from a single galvanic sensor. A microcomputer controlled switch shunts only inspired gas (based on the CO_2 breath detection) to the sensor for 20 seconds, to obtain a stable O_2 concentration. The inspired gas is then measured for 15 seconds, and the concentration appears to the left of the slash. The expired gas is then supplied to the sensor for 20 seconds and measured for 15 seconds. The expired value is displayed to the right of the slash. This cycle repeats continuously as long as breaths are detected.

O_2 Trend Display

Eight hours of inspired O_2 concentration trend data with one point every two minutes are displayed. The available display ranges are 10-70% (default), or 10-100%.

O_2 Breath-by-Breath Trend Display

If selected on the Setup Screen, a 200-breath trend of inspired and expired values appears. Tick marks denote five-minute intervals in this trend.

O_2 Alarms

Alarm Message	Default	Range	Type
LOW INSPIRED O_2	18%	18-100%	Emergency
HIGH INSPIRED O_2	OFF	OFF, 18-100%	Emergency

Note: The LOW INSPIRED O_2 alarm may not be disabled.

C. SpO_2 Displays (Optional Feature)

SpO_2 Digital Display

The SpO_2 digital value appears in a large font size. The pulse rate appears above the SpO_2 value in a smaller font size. A beating heart icon appears for each detected pulse. An SpO_2 beep tone, with a pitch proportional to the SpO_2 value, occurs with each detected pulse.

SpO_2 Waveform/Trend Display

The plethysmograph appears in a window with a signal strength indicator on the right side. The plethysmograph may be either autoscaled (default) or fixed scale as selected from the Setup Screen. Seventy minutes of SpO_2 trend, one point every two minutes, appears with an SpO_2 scale on

SpO_2 Trend Display

Eight hours of SpO_2 trend appears with one point every two minutes. Available display ranges are 80-100% (default) or 50-100%.

SpO_2 Breath-by-Breath Trend Display

If selected on the Setup Screen, a 200-breath trend of the SpO_2 value is displayed. Tick marks denote five-minute intervals in this trend.

SpO_2 Alarms

Alarm Message	Default	Range	Type
LOW SpO_2	90%	OFF, 50-100%	Emergency
LOW PULSE RATE	OFF	OFF, 40-150 bpm	Warning
HIGH PULSE RATE	OFF	OFF, 80-250 bpm	Warning
HIGH SpO_2	OFF	OFF, 70-99%	Warning

D. N_2O Displays

N_2O Digital Display

Mean N_2O% over a five-second interval.

N_2O Trend Display

Eight hours of N_2O trend, with one point every two minutes.

Display ranges are 0-100% (default), or 40-80%.

N_2O Breath-by-Breath Trend Display

If selected on the Setup Screen, a 200-breath trend of inspired and expired values appears. Tick marks denote five-minute intervals in this trend.

N_2O Alarms

Alarm Message	Default	Range	Type
HIGH N_2O	80%	OFF, 1-99	Emergency

E. Airway Pressure Displays

Airway Pressure Digital Display

The peak pressure over the previous breath is displayed to the left of the slash. The minimum pressure over the previous breath is displayed to the right of the slash. The mean airway pressure over the previous breath appears in parentheses beneath the slash.

When interfaced to the 78xx ventilator, the waveform can be received by connecting a tee into the pressure line. Data from the ventilator is MAX pressure, MIN pressure, and PLAT (pressure plateau).

Airway Pressure Waveform/Trend Display

The pressure waveform appears with the scale on the right side. Seventy minutes of trend, one point every two minutes, appears on the left side.

Note: The airway pressure waveform will not be in phase with the CO_2 waveform due to CO_2 sample transit time delay.

Airway Pressure Trend Display

Peak pressure is the top value and minimum pressure is the bottom value. Eight hours of trend with one point every two minutes appears. Available display ranges are -10 to 20 (default), -25 to 50, and -40 to 80 cm H_2O.

Airway Pressure Breath-by-Breath Trend Display

If selected on the Setup Screen, a 200-breath trend of peak and minimum pressure appears. Tick marks denote five minute intervals in this trend.

Airway Pressure Alarms

Note: When interfaced to the 78xx ventilator, pressure alarm limits cannot be selected. These alarm limits are set on the ventilator.

Alarm Message	Default	Range	Type
HIGH SUSTAINED P_{AW} (15 sec)	30 cm H_2O	OFF, 10-30 cm H_2O	Emergency
SUB-ATMOSPHERIC P_{AW}-	15 cm H_2O	fixed	Emergency
HIGH P_{AW}	80 cm H_2O	OFF, 1-120 cm H_2O	Warning
LOW SUSTAINED P_{AW} (15 sec)	OFF	OFF, -10-20 cm H_2O	Warning

F. Tidal and Minute Volume Displays

Tidal and Minute Volume Digital Display

The tidal volume in milliliters appears to the right of TV. The minute volume in liters per minute appears to the right of MV. Both are optional features.

Flow Volume Activity Bar Graph

This is a graphical representation of the instantaneous flow in the expiratory limb. Full scale is 100 L/min.

Minute Volume Trend Display

Eight hours of minute volume trend, with one point every two minutes, appears. Available display ranges are 0-20 L (default) or 0-60 L.

Minute Volume Breath-by-Breath Trend Display

If selected on the Setup Screen, a 200-breath trend of inspired and expired values appears. Tick marks denote five-minute intervals in this trend.

Tidal and Minute Volume Alarms

Note: When interfaced to the 78xx ventilator, tidal/minute volume alarm limits cannot be selected. These alarm limits are set on the ventilator.

Alarm Message	Default	Range	Type
LOW TIDAL VOLUME	OFF	OFF, 50-2500 ml	Emergency
HIGH TIDAL VOLUME	OFF	OFF, 50-2500 ml	Warning
LOW MINUTE VOLUME	OFF	OFF, .2-50.0 L	Warning
HIGH MINUTE VOLUME	OFF	OFF, .2-50.0 L	Warning
REVERSE FLOW	OFF	N/A	Warning

Note: The REVERSE FLOW alarm can be enabled on the Setup Screen.

G. Patient Circuit O_2 Displays

Note: When interfaced to the 78xx ventilator, Circuit O_2 alarm limits cannot be selected. These alarm limits are set on the ventilator.

Patient Circuit O_2 Digital Display

The value shown is the patient circuit O_2 mean over five-seconds value. This is an optional feature.

Patient Circuit O_2 Alarms

Alarm Message	Default	Range	Type
LOW CIRCUIT O_2	18%	18-99%	Emergency
HIGH CIRCUIT O_2 %	OFF	OFF, 18-99%	Warning

Note: The Low Patient Circuit O_2 alarm cannot be disabled unless the Patient Circuit O_2 parameter is disabled on the Setup Screen. The display value for the Patient Circuit O_2 is also enabled on the Setup Screen.

Also Note: Permanent ALL MUTE cannot permanently mute the Low Circuit O_2 and VENT Low Circuit O_2 alarms.

H. Anesthetic Agent Displays

(Optional feature on the 5250 RGM)

WARNING: The 5250 RGM does NOT have the ability to identify anesthetic agents. If the agent selected on the monitor is not the agent delivered to the patient circuit, the values will be inaccurate. If a mixture of anesthetic agent is delivered, the monitor may not indicate accurate values.

WARNING: In the presence of alcohols, ketones, or other organic hydrocarbon vapors, the 5250 RGM will not indicate accurate readings of anesthetic agent. This includes their presence not only in the sample line or patient circuit, but also ethyl alcohol

Anesthetic Agent Digital Display

The anesthetic agent selected from halothane, isoflurane, enflurane, or no agent is shown. The value of the anesthetic agent also appears.

Anesthetic Agent Trend Display

Eight hours of the selected anesthetic agent trend, with one point every two minutes, appears. Available display ranges are 0-2% (default), 0-4%, or 0-6%.

Anesthetic Agent Breath-by-Breath Trend Display

If selected on the Setup Screen, a 200-breath trend of inspired and expired values appears.

Anesthetic Agent Alarms

Alarm Message	Default	Range	Type
LOW INSP AGENT	OFF	OFF, 0-10%	Emergency
HIGH INSP AGENT	See notes	OFF, 0-15%	Emergency
LOW EXP AGENT	OFF	OFF, 0-10%	Emergency
HIGH EXP AGENT	See notes	OFF, 0-15%	Emergency

Notes:

1. When an agent is selected, the following high limits are automatically set:

	High Insp.	High Exp.
Halothane	4.5%	1.7%
Isoflurane	5.5%	3.5%
Enflurane	6.5%	4.2%

2. When the user reviews or changes the agent limits, those limits remain fixed until the unit is switched off.
3. If NO AGENT is selected, the RGM will alarm if trace agent is detected. The message AGENT DETECTED appears and SET AGENT will flash.

2.5 Changing the Setup

Refer to Figure 2-8.

1. Select MENU from the display screen.
2. Select SETUP from the menu. The Setup Screen appears.
3. Select the desired parameter from the left side of the screen.
4. Select the desired option from the right side of the screen.
5. Select VIEW ALL to see all parameters and the current options selected.
6. If preset programmed options are desired, press DEFAULT.
7. Select REC CAL to set up a strip chart recorder connected to the analog output.
8. Select EXIT from the Setup Screen to return to the display screen.

The following list describes the parameters on the Setup Screen:

Agent lets you select the current agent type being delivered to the patient. The menu on the right shows the agent selection. At powerup, the No Agent option is selected.

Alarm volume lets you select the volume for alarms. The higher the number, the louder the volume.

Note: If the monitor is powered down with the alarm volume set to one, the alarm volume upon next powerup will be set to two.

Circuit O_2 lets you disable the circuit O_2 alarm and the display of the circuit O_2 value.

Display labels shows additional descriptive text (I/Et, MAX/MIN) for the parameters. After you know the parameters, you can turn off the extra labels for a less cluttered screen.

Note: If 78xx is selected for the RS-232 device, the only available mute period is 30 seconds.

Language lets you select either English, French, German, Spanish, or Italian for your screens. If you change your screens to a foreign language that you don't speak and you want to change back to English, the translated Language parameter is as follows: English, Language; French, Langue; German, Sprache; Spanish, Idioma; and Italian, Lingua.

Mute period lets you change the length of time all of the alarms will be muted. Your options are 30, 60, 90, and 120 seconds.

Note: If 78xx is selected for the RS-232 device, the only available mute period is 30 seconds.

N_2O display lets you eliminate the display of nitrous oxide.

Patient type lets you adjust the scale factors for the flow sensor to the patient type (adult or pediatric). Use the adult setting for a tidal volume that is greater than 250 ml/breath.

Pleth scaling (with SpO_2) when set to auto, automatically scales the plethysmogram to full-scale. When set to non-auto, it fixes the scale at the current value.

Print period sets the rate of output for display of information for the RS-232 port. If it is set to 10 seconds, you get one printed line of data every 10 seconds. The system test parameter is used only for inhouse or manufacturing testing of the unit.

Pulse beep vol (with SpO_2) sets the volume for the pulse beep. Volume is determined by the operator. Pitch is determined by the patient condition. The higher the number, the louder the sound.

Rev. flow det lets you turn on and off the reverse flow alarm, which detects the reverse flow of the tidal volume sensor. The alarm should be off when the sensor is placed at the proximal location (in the patient airway). It should be on when placed at the distal location (in the expiratory limb) in order to detect an imcompetent valve.

RS-232 device lets you select the communication parameters for the device that is communicating with the RS-232 port, for example, a printer.

Service mode lets you display RGM maintenance screens.

SpO_2 average lets you average the SpO_2 values over three or six seconds. Slow (six seconds) smooths out the changes in SpO_2 values, and fast (three seconds) tracks rapid changes in the SpO_2 value.

Sweep rate lets you select fast (12.5 mm/sec) or slow (6.5 mm/sec) waveform display refresh.

Trend time lets you select the display for the trends on the display screen, either every breath or eight-hour.

Wave type lets you choose the wave display characteristics that you prefer. Scroll shows the waveform moving across the screen from right to left. With erase bar, the waveform is stationary.

2.6 Selecting the Waveforms, Trends, and Scales

Refer to Figure 2-9.

Modifying Waveforms and Trends

1. Select WAVE from the display screen. This highlights the three waveform titles and the scale displays.
2. Select the desired waveform by touching the top, middle, or bottom highlighted waveforms. After your selection, the waveform and trend choices appear.
3. Select the desired waveform or trend. Your selection is implemented.
4. Select EXIT to return to the display screen.

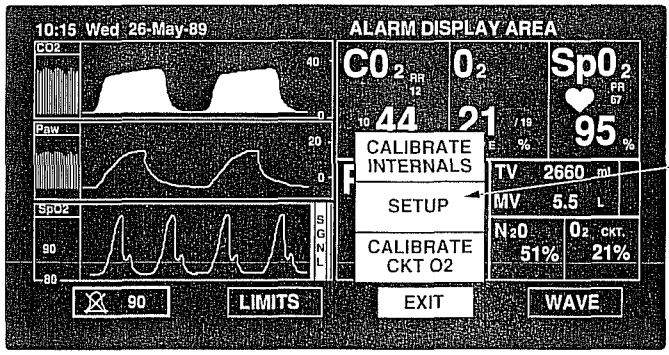
Freezing Waveforms

1. Pressing MENU freezes the waveforms.
2. Pressing EXIT unfreezes the waveforms.

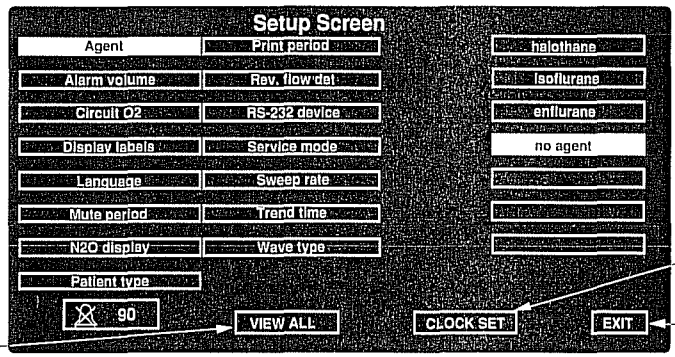
Modifying Scales

1. Select WAVE from the display screen. This highlights the three waveform titles and the scale displays.
2. Select desired scale display by touching the top, middle, or bottom highlighted scale.
3. Select the desired scale from the menu. Your selection is highlighted and implemented.

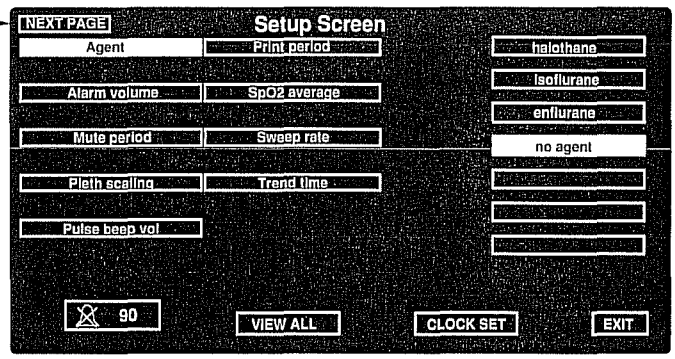
   Note: If two of the same waveform displays are selected for viewing, the scale selection changes both waveform displays to the same scale.
4. Select EXIT to return to the waveform display.



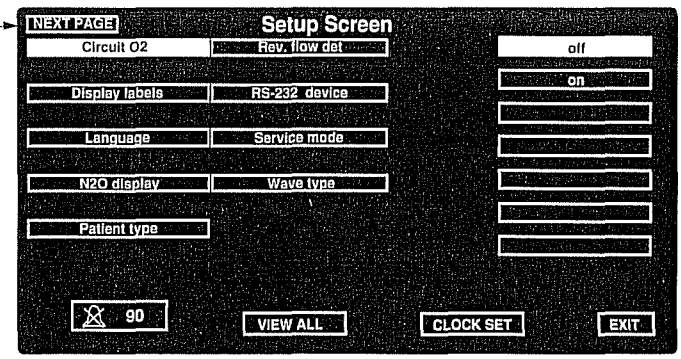
Display Screen and Menu



One-page Agent without SpO_2 Setup Screen

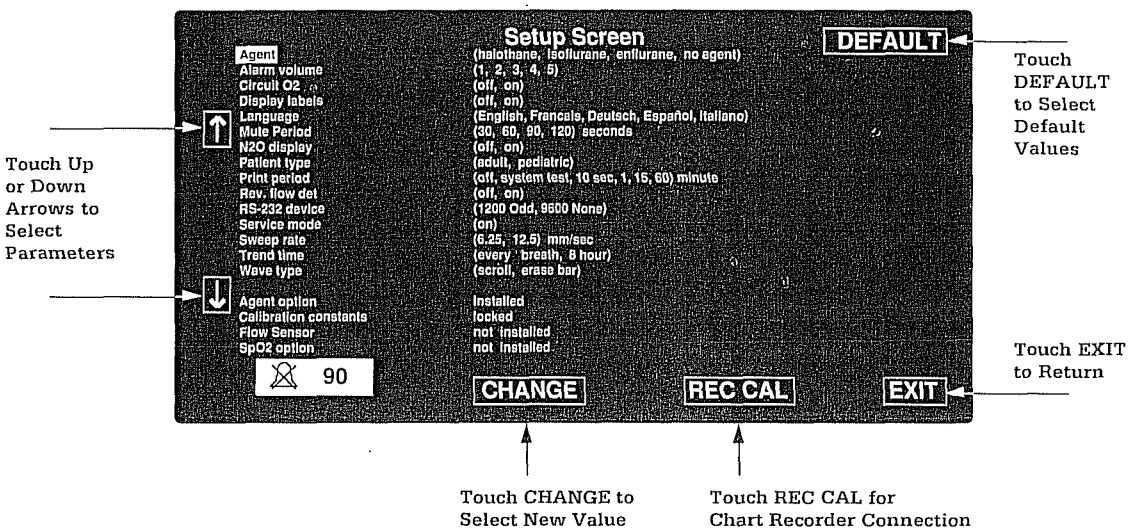


First Page of Two-page Agent with SpO_2 Setup Screen



Second Page of Two-page Agent with SpO_2 Setup Screen

Figure 2-8
Setup Screen Changes


Setup Screen
DEFAULT
Agent (halothane, isoflurane, enflurane, no agent)
Alarm volume (1, 2, 3, 4, 5)
Circuit O2 (off, on)
Display labels (off, on)
Language (English, Francais, Deutsch, Español, Italiano)
Mute Period (30, 60, 90, 120) seconds
N2O display (off, on)
Patient type (adult, pediatric)
Print period (off, system test, 10 sec, 1, 15, 60) minute
Rev. flow det (off, on)
RS-232 device (1200 Odd, 9600 None)
Service mode (on)
Sweep rate (6.25, 12.5) mm/sec
Trend time (every breath, 8 hour)
Wave type (scroll, erase bar)
Agent option Installed
Calibration constants locked
Flow Sensor not installed
SpO2 option not installed
90
CHANGE
REC CAL
EXIT
Touch Up or Down Arrows to Select Parameters
Touch DEFAULT to Select Default Values
Touch EXIT to Return
Touch CHANGE to Select New Value
Touch REC CAL for Chart Recorder Connection

View All Setup Screen

The View All Setup Screen is two pages when the monitor includes Agent and SpO2. Touch NEXT PAGE to go back and forth between the two pages.

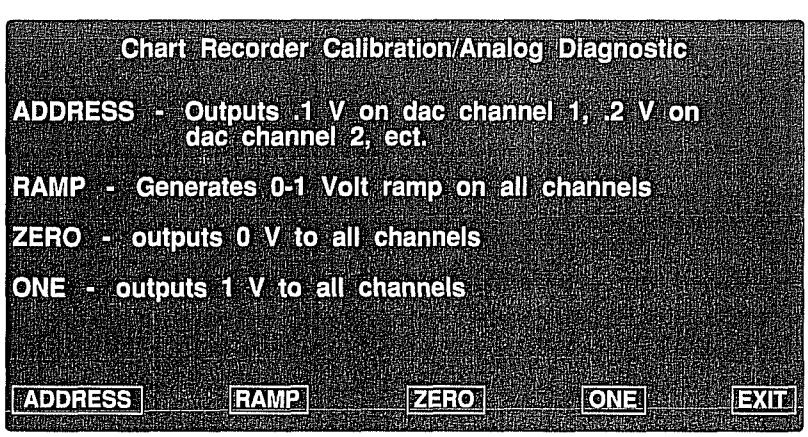


Chart Recorder Calibration/Analog Diagnostic
ADDRESS - Outputs .1 V on dac channel 1, .2 V on dac channel 2, ect.
RAMP - Generates 0-1 Volt ramp on all channels
ZERO - outputs 0 V to all channels
ONE - outputs 1 V to all channels
ADDRESS
RAMP
ZERO
ONE
EXIT

Chart Recorder Calibration/Analog Diagnostic Screen

WAVE Select Options

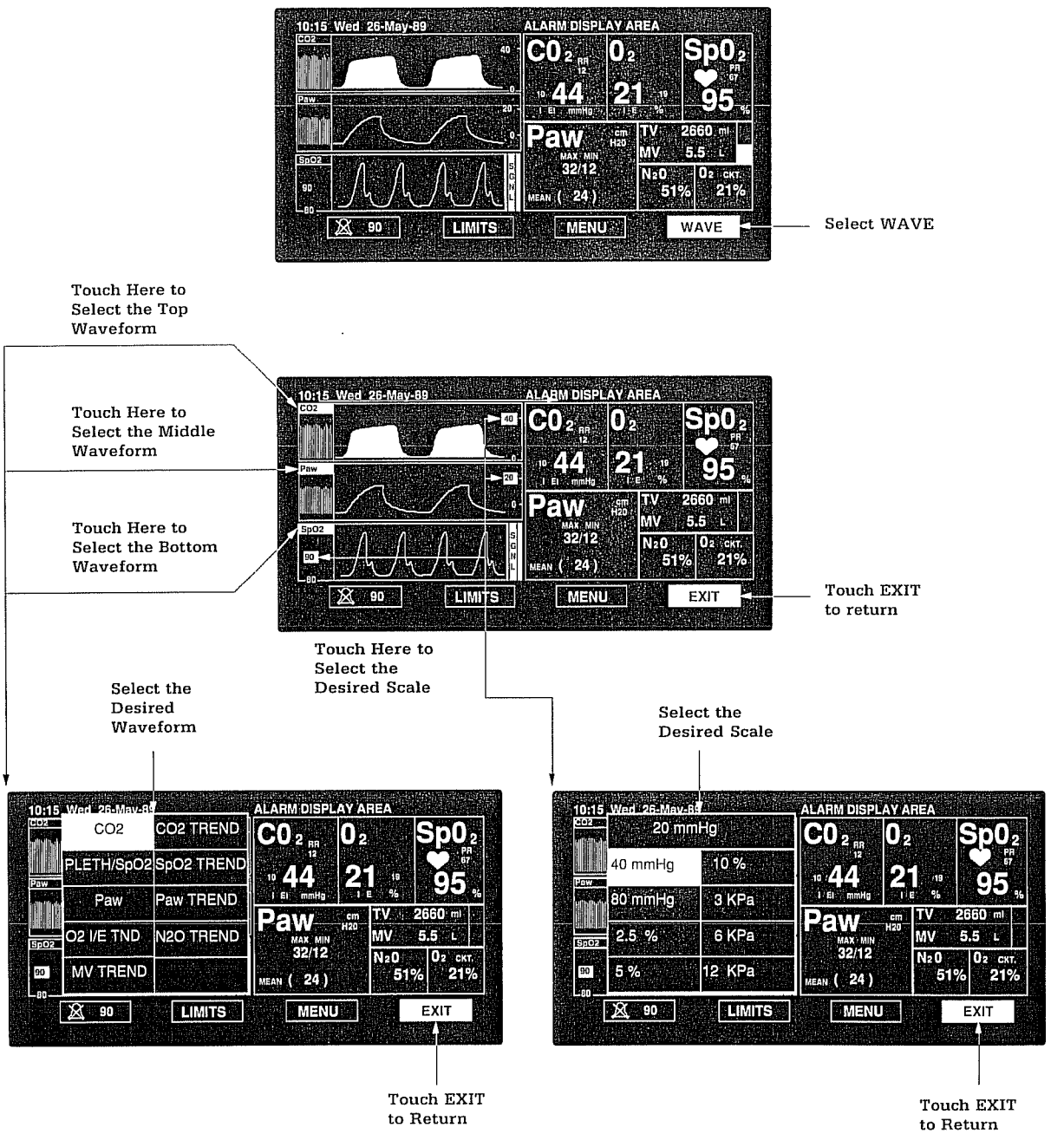


Figure 2-10
Waveform/Trend and Scale Selection

2.7 Changing Alarm Limits (Thresholds)

Refer to Figure 2-11.

1. Select LIMITS from the display screen.

   When LIMITS is selected two menus appear on the screen. The left menu lists the available parameter groups, and the right menu lists the individual parameters for the highlighted group.
2. To view or change an alarm limit, select one of the five available options from the menu on the left.
3. Select an individual alarm limit from the menu on the right.
4. After selecting one of the alarms from the menu on the right, press SELECT, which is located below the menu. This brings up the alarm adjustment window.
5. Observe the high and low alarm levels indicated on the screen. If adjustment is required, press the alarm adjustment keys (up and down arrows) to set the high and/or low alarms to the desired level. The new alarm limit is displayed on the screen during adjustment. Adjustment to "----" disables that particular alarm.

   Note: To make a large adjustment, hold your finger on the adjustment key and the alarm limit changes very quickly. To make a small adjustment, touch the screen with your finger and remove it, in steps, until you reach the desired alarm setting.
6. After viewing or adjusting the alarm limits, touch SELECT to view or adjust another alarm limit, or touch EXIT to return to the display screen.
7. Repeat the procedure to view or adjust all of the alarm levels.

2.8 Alarm Types

The following are types of alarms:

Emergency Alarms:	Signals that indicate a condition requiring immediate action.
Visual Indication:	A flashing red indicator appears on the lower left area of the display. A message indicating the nature of the alarm is displayed at the top of the screen. The affected parameter flashes as long as the alarm condition exists.
Audible Indication:	Three high tones every five seconds, which resets automatically when the condition causing the alarm is cleared.
Single Tone Emergency Alarms:	Signals that indicate a condition requiring immediate action.
Visual Indication:	A message appears on the top line of the display screen accompanied by a flashing red indicator on the lower left area of the display.
Audible Indication:	One high tone and one low tone, once when the condition occurs. The message is removed when the condition causing the alarm is cleared.
Warning Alarms:	Signals that indicate a condition requiring prompt action.
Visual Indication:	A flashing yellow indicator appears on the lower left side of the display. A message indicating the nature of the alarm is displayed at the top of the screen. The affected parameter flashes as long as the alarm condition exists.
Audible Indication:	Three low tones every 10 seconds, which resets automatically when the condition causing the alarm is cleared.
Advisory Alarms:	Signals that indicate a condition requiring operator awareness but not necessarily action.
Visual Indication:	A message appears on the top line of the display screen.
Audible Indication:	One high tone and one low tone, once when the condition occurs. The message is removed when the condition causing the alarm is cleared.
Silent Advisory Alarms:	Signals that indicate a condition requiring operator awareness but not necessarily action.
Visual Indication:	A message appears on the top line of the display screen.
Audible Indication:	No audible indication. The message is removed when the condition causing the alarm is cleared.
System Failure Alarms:	Signals that indicate a condition of hardware failure within the RGM and necessitate its removal from operation.
Visual Indication:	See the list of alarm messages in Section 8.2.
Audible Indication:	Continuous alarm tone.

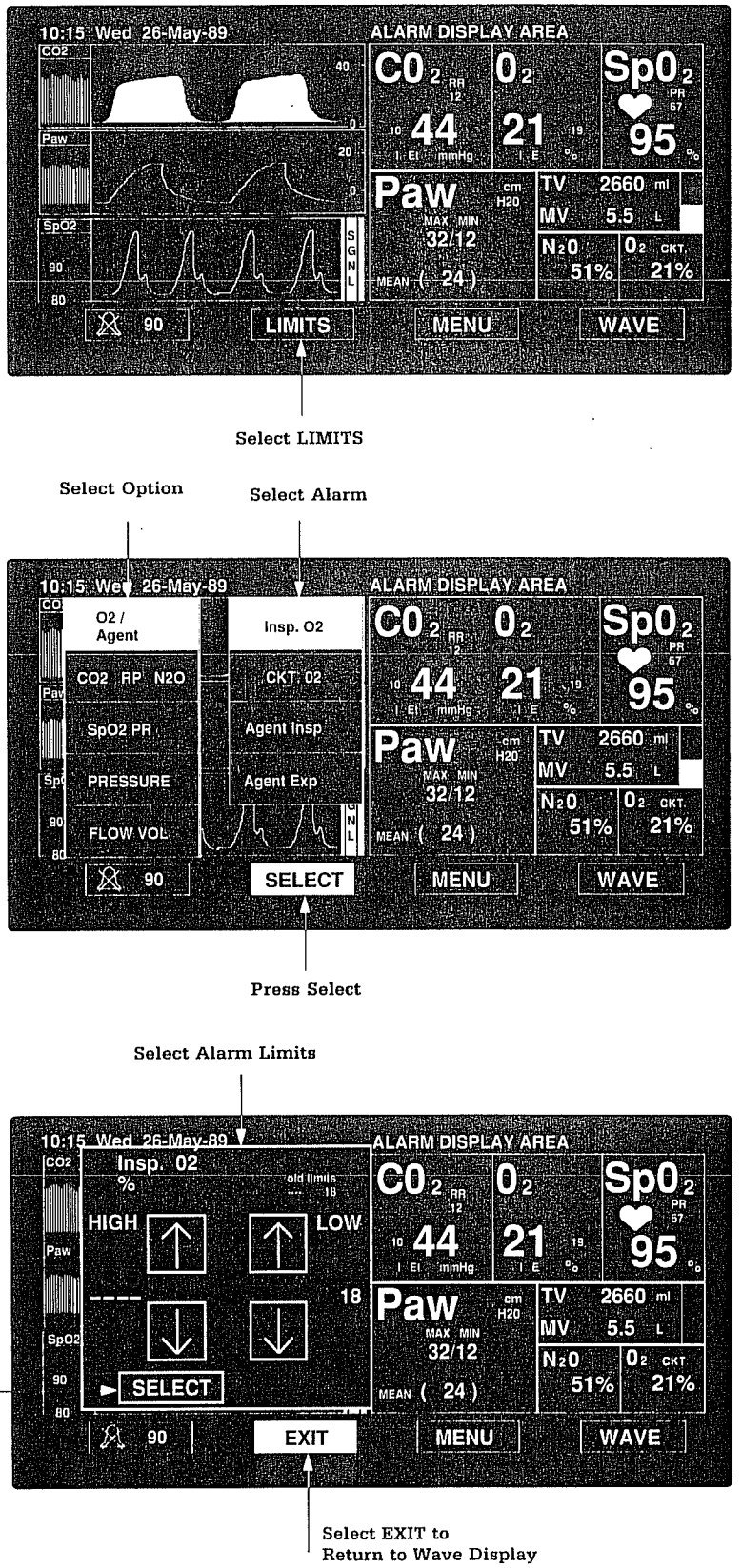


Figure 2-11
Changing Alarm Limits

3.1 Respiratory Gas Calibration

WARNING: Handle the 5250 RGM with care. Damage to the RGM or inaccurate operation may result from improper handling.

WARNING: Do not operate the 5250 RGM unless it is properly calibrated. Inaccurate patient parameter readings will result.

WARNING: If the RGM fails to respond as described in the calibration procedure, do not use that portion of the monitor until the malfunction is corrected.

Note: The RGM must be calibrated in the calibrate mode detailed below. Do not use a pressurized calibration gas to check the readings in the monitoring mode. In the monitoring mode the RGM records peak values, and if the gas is supplied under pressure, the displayed readings may be slightly higher than the actual gas value.

To ensure that the gas monitoring portion of the RGM is working properly, a periodic calibration by the operator is required. Perform the following calibration checks whenever the accuracy of the RGM is suspect and whenever the RGM is returned to use after service. Two forms of calibration are involved: Zero (baseline) calibration, and Span calibration, which requires a calibration gas.

A. Zero Calibration

The RGM automatically zeros after five minutes, then every hour; however, the RGM should be manually zeroed prior to calibration, as detailed in the calibration procedure. Since the RGM aspirates the patient sample, contaminants that may be present can accumulate in the gas optical detector. More contaminants accumulate in a high humidity and high patient secretion environment (such as an ICU) than in a dryer environment (such as an OR).

Contaminants in the optical detector offset the zero baseline. The RGM's auto zero controls are used to compensate for the zero offset. When the offset due to contaminants becomes too large to be calibrated out, the measurement chamber of the optical detector must be cleaned and the zero calibrated. (Refer to Section 7.8 "Cleaning the Sample Chamber.")

B. Span Calibration

In a relatively clean environment, the span calibration drift is less than 1.5 mmHg for CO_2, 2% for N_2O, and 3 mmHg for agent, within a 24-hour period of operation. Although the monitor remains in calibration over long periods, perform the Span calibration of the monitor periodically, as described in this section.

C. Zero and Span Calibration Procedure

Refer to Figures 3-1 and 3-2.

1. Connect a sample tube to the sample inlet. Check that all connections are properly made and secure.
2. Switch the monitor on and allow it to warm up for five minutes.
3. Select MENU from the display screen.
4. Select CALIBRATE INTERNALS from the menu.
5. Select ZERO from the Calibrate Screen. The word ZEROING appears on the screen. After approximately 25 seconds, the message ZERO COMPLETE appears. If error messages appear on the screen, refer to "Troubleshooting Guide" in Section 8.2 of this manual.
6. Connect the required Ohmeda calibration gas (as indicated on the screen) to the sample inlet as shown in Figure 3-2. Connect the free end of the sample tube to the female luer connector of the calibration reservoir bag. Connect the tubing from the other end of the Reservoir to the can of calibration gas.
7. Once the pumping action of the monitor has automatically evacuated the reservoir bag, the RGM automatically generates a one high tone and one low tone alarm, and the message BEGIN SPAN CALIBRATION then appears.
8. Press down on the valve stem of the cal gas canister until the reservoir bag fills but is not pressurized, then touch SPAN on the Calibrate Screen.

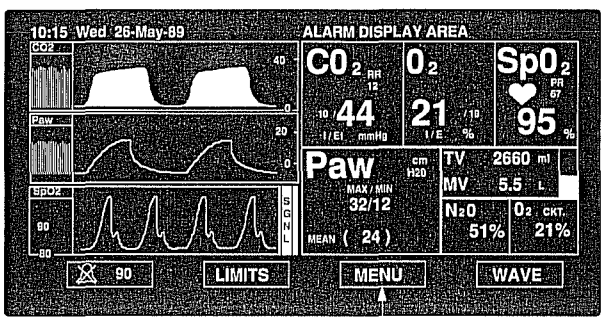
   Note: Do not overinflate the reservoir bag. Do not attempt the calibration process if there are any leaks in the bag or tubing. Prevent the bag from emptying before the span is complete by adding more gas to the bag.
9. After about 20 seconds, when the message SPAN COMPLETE appears, the process is completed. Verify that the values displayed on the screen are the same as those on the calibration gas canister, within the following tolerances: CO_2 ±0.1%, N_2O ±1%, O_2 ±1%, and halocarbon-22 ±0.1%.

If the Span calibration is unsuccessful, the message INVALID SPAN appears on the screen, and you should repeat the span calibration. If necessary, refer to "Troubleshooting Guide" in Section 8.2.

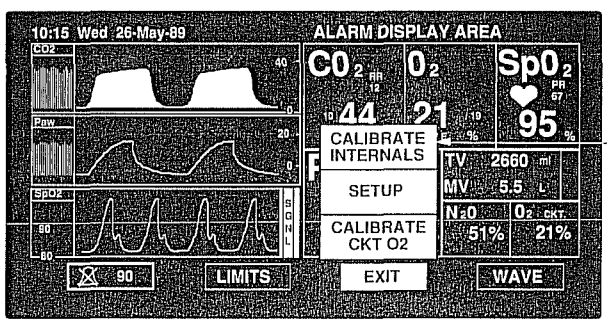
10. Disconnect the calibration gas from the sample inlet.
11. Select EXIT from the Calibrate Screen to return to the display screen.
12. Store the gas reservoir bag in a location where it will be safe from puncture.

Note: If the reservoir bag does not fill up, either the canister is empty or the brass restrictor is blocked.

WARNING: For the 5250 RGM without Agent, use only Ohmeda calibration gas or calibration gas of 6% CO_2, 50% O_2, and 44% N_2O (±0.05 volume % gravimetric standard). For the 5250 RGM with Agent, use only Ohmeda calibration gas of 4% halocarbon-22, 6% CO_2, 40% N_2O, and 50% O_2. Refer to Section 6.1 to order calibration gas.

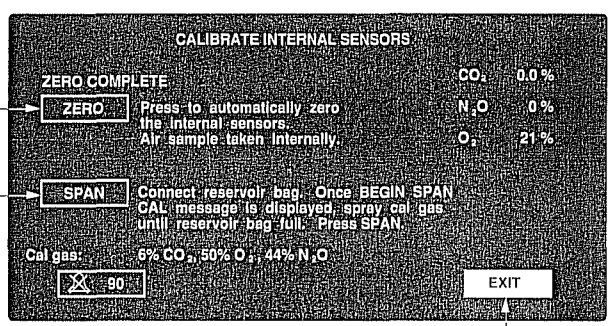


Select MENU



Select Calibrate Internals

(Non-agent Calibrate Screen)

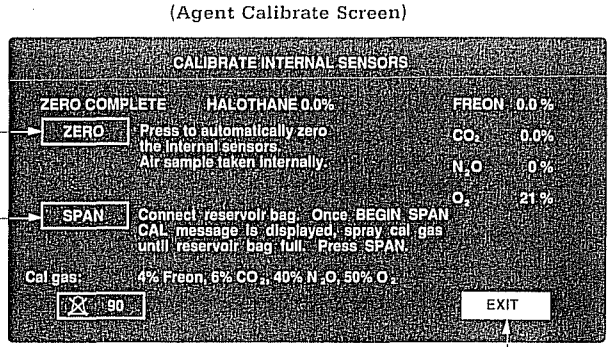

CALIBRATE INTERNAL SENSORS
ZERO COMPLETE
ZERO
Press to automatically zero the internal sensors. Air sample taken internally.
CO2 0.0 %
N2O 0 %
O2 21 %
SPAN
Connect reservoir bag. Once BEGIN SPAN CAL message is displayed, spray cal gas until reservoir bag full. Press SPAN.
Cal gas: 6% CO2, 50% O2, 44% N2O
90
EXIT

Zero Calibration

Span Calibration

Touch EXIT to return

(Agent Calibrate Screen)


CALIBRATE INTERNAL SENSORS
ZERO COMPLETE
HALOTHANE 0.0%
FREON 0.0 %
ZERO
Press to automatically zero the internal sensors. Air sample taken internally.
CO2 0.0%
N2O 0 %
O2 21 %
SPAN
Connect reservoir bag. Once BEGIN SPAN CAL message is displayed, spray cal gas until reservoir bag full. Press SPAN.
Cal gas: 4% Freon, 6% CO2, 40% N2O, 50% O2
90
EXIT

Zero Calibration

Span Calibration

Figure 3-1

3.2 Patient Circuit O_2 Sensor Calibration Procedure

Note: Before calibrating the patient circuit O_2 sensor, turn the RGM on and allow the O_2 sensor output to stabilize for at least five minutes. In cases where a new sensor cartridge has been installed, the five minute stabilization assumes that the cartridge was removed from its sealed protective packaging just before calibration, and that the shorting foil or clip was in place. If the cartridge is not packaged with a shorting foil or clip, it must be shorted or installed on the monitor for as long as 14 hours before the sensor will meet specifications.

1. Switch the monitor on and allow it to warm up for five minutes.
2. Select MENU from the display screen.
3. Select CALIBRATE CKT O_2 from the menu. The Calibrate Circuit O_2 Sensor Screen appears. Refer to Figure 3-3.
4. Expose the sensor to room air for a minimum of two minutes.
5. Press 21% O_2. Wait approximately 25 seconds until the ZERO COMPLETE message appears.
6. Apply 100% O_2 to the circuit O_2 sensor to flush the room air from the sensor housing.
7. While continuing to apply 100% O_2 to the sensor, press 100% O_2. The message SPAN CALIBRATING appears for approximately 25 seconds. Wait for the message SPAN COMPLETE to appear.
8. CKT O_2 should read 100% O_2 within ±1% at the completion of the span.
9. Select EXIT from the Calibrate Circuit O_2 Sensor Screen, to return to the display screen.

3.3 Calibration of Other Parameters

Calibration of other parameters, such as airway pressure, barometric pressure, sample flow, etc., is described in the Appendix or in the Ohmeda 5250 Respiratory Gas Monitor Service Manual.

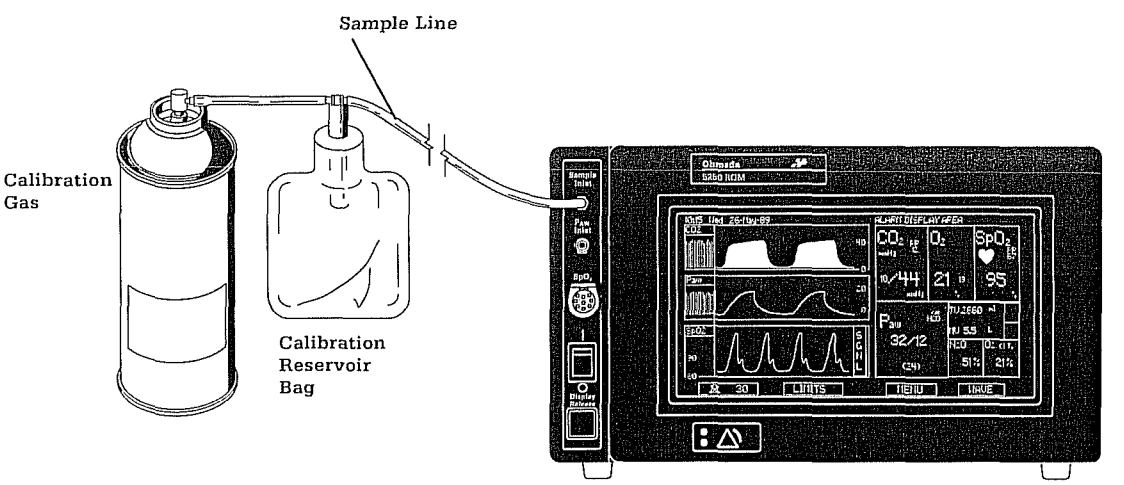
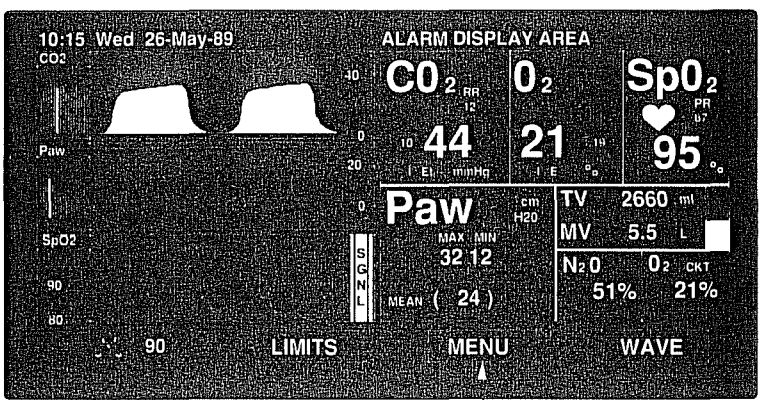
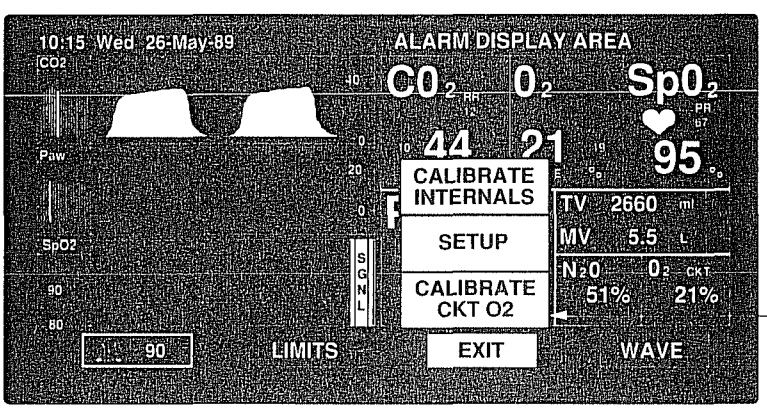


Figure 3-2
Calibration Gas Connection


10:15 Wed 26-May-89
ALARM DISPLAY AREA
CO2
Paw
SpO2
90
80
CO2 RR
44
0 2
21
SpO2
PR
95
Paw
MAX MIN
32 12
MEAN (24)
TV 2660 ml
MV 5.5 L
N2O 0 2 CKT
51% 21%
90
LIMITS
MENU
WAVE
Select MENU


10:15 Wed 26-May-89
ALARM DISPLAY AREA
CO2
Paw
SpO2
90
80
CO2 RR
44
0 2
21
SpO2
PR
95
CALIBRATE INTERNALS
SETUP
CALIBRATE CKT O2
TV 2660 ml
MV 5.5 L
N2O 0 2 CKT
51% 21%
90
LIMITS
EXIT
WAVE
Select Calibrate CKT O2

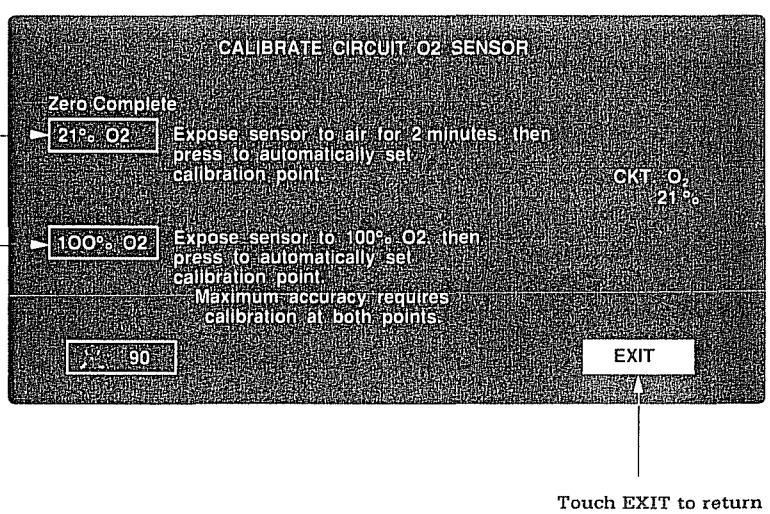

CALIBRATE CIRCUIT O2 SENSOR
Zero Complete
21% O2
Expose sensor to air for 2 minutes, then press to automatically set calibration point.
CKT O2
21%
100% O2
Expose sensor to 100% O2, then press to automatically set calibration point.
Maximum accuracy requires calibration at both points.
90
EXIT
Room Air Calibration
100% O2 Calibration
Touch EXIT to return

Figure 3-3

4.1 Patient Connections for CO_2, N_2O, O_2, and Anesthetic Agent

1. Connect one end of the sample tube (luer connector) to the connector labeled "Sample Inlet" on the front of the 5250 RGM. Ensure that the sample inlet connection is secure.
2. Attach the sample tube to the luer fitting of the patient circuit adapter. Ensure that the sample tube fits securely into the patient circuit adapter.
3. Place the patient circuit adapter at the proximal end of the patient circuit.
4. Ensure that the sample tube assembly is in good condition. If not, replace with a new sample tube assembly. Some purging may occur if the sample tube assembly is changed while the monitor is in operation.

CAUTION: Empty the fluid trap before each patient or whenever the trap is more than half full. Failure to empty the trap may allow it to fill while monitoring a patient and cause the monitor to stop sampling gas.

5. Ensure that the sample exhaust (on the back panel) is connected to the gas scavenging system or returned to the patient circuit.

Refer to Figure 4-1 for the following.

The right angle adapter (1) or the straight adapter (2) should be used for monitoring environments where little or no mucus is present in the patient breathing circuit, such as in an Operating Room (OR) environment. High humidity and light fluids, such as water, will be separated by the fluid separator and collected in the fluid trap. Heavy mucus may, however, clog the separator. Therefore, if the monitor is likely to aspirate heavy mucus, use the straight adapter with a replaceable filter (3), instead.

If the filter becomes occluded, it can be removed and either cleaned or replaced. The tee-piece adapter (less filter) (3) can be cold sterilized or replaced as a unit with the replaceable filter.

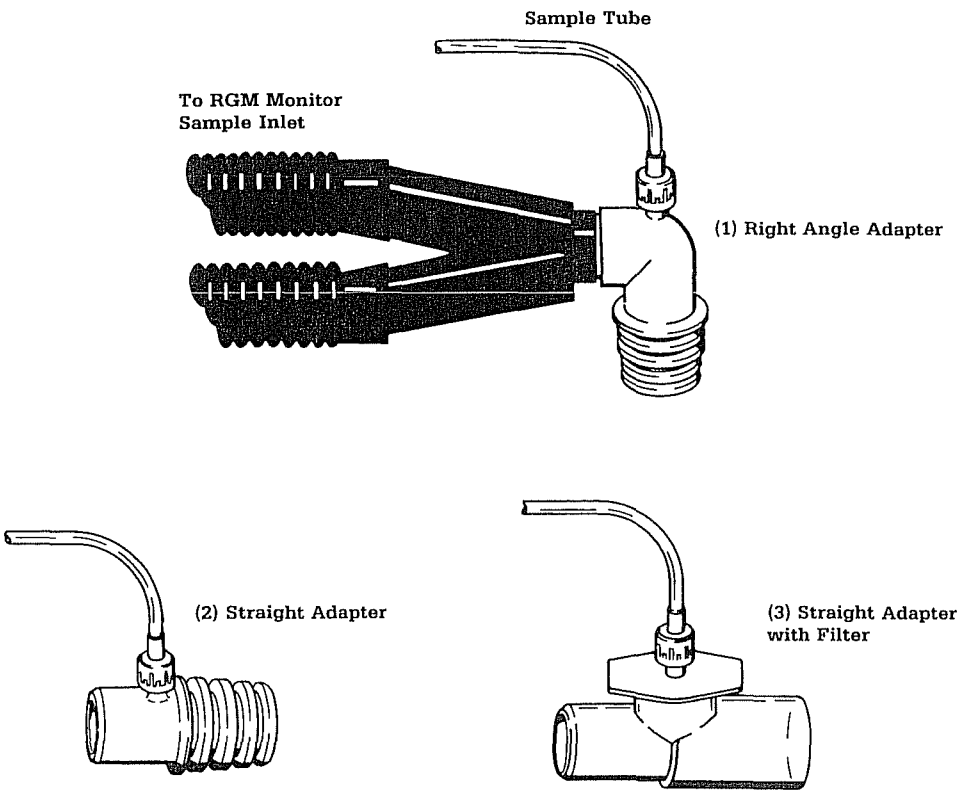


Figure 4-1
Patient Circuit Adapters (Proximal): See Section 6.1, *Accessories*, for Part Numbers

4.2 SpO_2 Patient Connections

WARNING: Use only Ohmeda probes with Ohmeda oximeters and monitors; otherwise, patient injury or equipment damage may result.

WARNING: Patient Safety–Exercise extreme care to assure continued circulation distal to the probe site after application.

WARNING: Patient Safety–Prolonged monitoring or patient condition may require changing the probe test site periodically. Change the probe site at least every four hours to reduce the risk of blistering, skin erosion, or ischemic skin necrosis (especially if the site is poorly perfused).

See the instructions shipped with your probes for further information, or refer to the *Ohmeda Probes Manual*, part number 0380-0900-085.

Signal and Data Validity

The following oximeter indicators are useful in determining that the probe is correctly attached to the patient and that the data is verifiable:

- The heart rate indicator is active.
- The plethysmographic waveform is strong.
- The SpO_2 numeric display is stable.
- The signal strength bar graph indicates a strong signal.
- The SpO_2 beep sounds with every heart beat.

It is important to observe all five indicators simultaneously when verifying signal strength.

Signal strength indicator: The alarm message LOW QUALITY SpO_2 SIGNAL appears above the display when the signal is questionable. Check that the probe is properly attached to the patient. A remedy may be to perfuse (massage) the test site and reapply the probe, or to select an alternate test site.

Very dark pigmentation or a large distance between the probe emitter and detector can reduce the signal strength and result in a poor signal. If the signal strength is half-scale or less, a test site with a shorter distance between the emitter and the detector might be a possible solution.

Plethysmographic waveform: Three complete passes of the plethysmographic waveform should be easily identified. Although the waveform shape may vary from patient to patient, under normal conditions it corresponds to the arterial pressure waveform.

Figure 4-2 shows four good waveforms: a useful guideline in finding a probe placement that generates the fewest noise spikes.

If noise is seen on the waveform because of poor probe placement, the detector may not be flush with the test site (see example of a noisy waveform in Figure 4-3). Check that the probe is se-cured and that the tissue sample is not too thick.

Pulse rate, determined from the plethysmographic waveform, can be disrupted by a cough or other hemodynamic pressure disturbances. Motion at the test site is indicated by noise spikes in the waveform as shown in Figure 4-3.

If three good passes of the waveform do not occur, check the patient and the oximeter setup.

SpO_2 numeric display: The stability of the SpO_2 readings can be used as an indicator of signal validity. With a small amount of practice, you can get a good feeling for changes in the signal that are artifactual or physiological and the speed of each.

The stability of the readings over time varies according to which sweep rate is selected. In the slower mode, the readings have a tendency to be more stable, because the signal averaging is done over a longer period of time: six seconds in the slow mode versus three seconds in the fast mode.

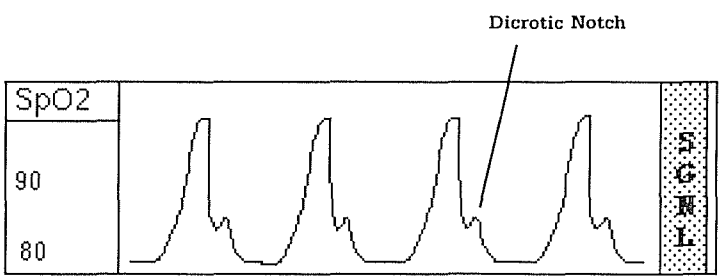


Figure 4-2

Important: If the pulse rate drops to 40 BPM or less, both SpO_2 and pulse rate are dashed. If a Low Pulse Rate alarm is enabled, a warning alarm tone (three low tones) sounds, the red alarm light flashes, and the Low Pulse Rate alarm and the pulse rate flash on the Digital Display. If the Low Pulse Rate alarm is NOT enabled, the alarm will not be activated.

Signal strength bar graph: The signal strength bar graph indicates the quality of the signal from the SpO_2 probe.

SpO_2 beep: An SpO_2 beep tone, with a pitch proportional to the SpO_2 value occurs with each beat of the heart.

4.3 Airway Pressure Patient Connection

Refer to Figure 4-4.

WARNING: Do not place the airway pressure adapter on the expiratory check valve of the absorber. Blockages in the tubing circuit can cause high patient airway pressures and may not be detected by the RGM.

CAUTION: Pressure in excess of 10 psi above atmospheric could damage the P_{AW} inlet or sample inlet to the RGM.

A built-in transducer senses the patient airway pressure via pressure sensing tubing connected to the breathing circuit. The following are ways to sense the airway pressure:

- Connect the pressure sensing tube to the P_{AW} Inlet port located on the front panel of the 5250 RGM.

  Connect the other end of the sensing tubing either to a circuit adapter tee, part number 6050-0000-456, or to the pressure sensing line of the ventilator. When mounting in the patient circuit, place the circuit adapter in the inspiratory limb (see Figure 4-4). Mount the adapter with the pressure outlet pointed up.

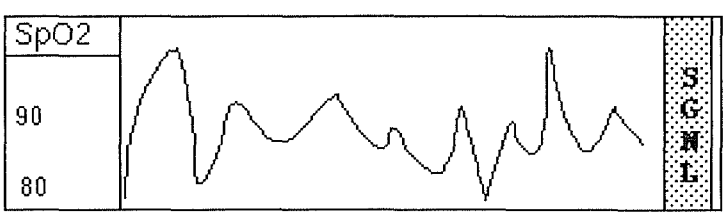


Figure 4-3
Noisy plethysmographic waveform

- The RGM pressure sense line can be connected to the GMS Absorber in a position beneath the pressure gauge (see Figure 4-5). Follow these steps:
  1. Remove the pressure gauge (A) from the GMS absorber by depressing the latch (B).
  2. Partially insert the retaining clip (C) into the coupling (D) from the side of the coupling with the hole (E). Be certain the raised point (F) on the clip is facing inward toward the pressure outlet (G).
  3. Fully insert the pressure gauge (A) into the coupling (D). The retaining clip (C) can be easily pushed in until the raised point touches the coupling body (D).
  4. As shown, use pliers or a similar tool to squeeze the retaining clip into the coupling body until the raised spot snaps into the hole on the coupling body. The clip will be retained in the coupling and extended out from the coupling about 3/16" (H). Replace the pressure gauge, with the coupling attached, into the GMS Absorber.
  5. Slip one end to the tubing over the pressure outlet on the coupling. Fasten the free end of the tubing to the pressure inlet on the monitor.

     Note: If the tee is already being used for a pressure sense line for a ventilator, you can cut the hose and insert an 1/8" tee, part number 6027-0000-005, at a convenient spot. Run a length of tubing from this tee to the RGM.
- In many instances a pressure sense line is attached via 1/8" tubing from the patient curcuit to the ventilator. This tubing can be cut at a convenient location, and an 1/8" tee (part number 6027-0000-005) can be inserted. Run a piece of tubing from this tee to the RGM.

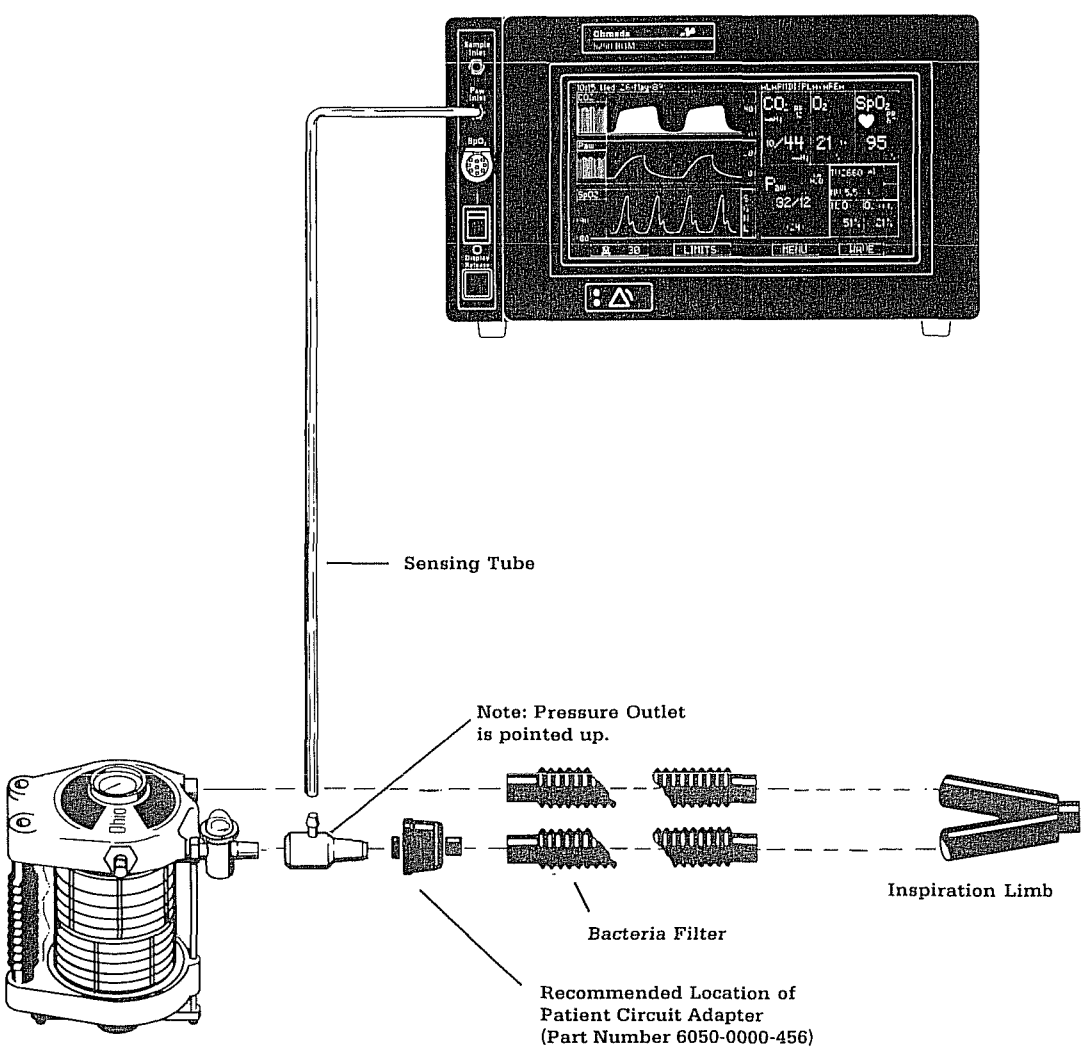
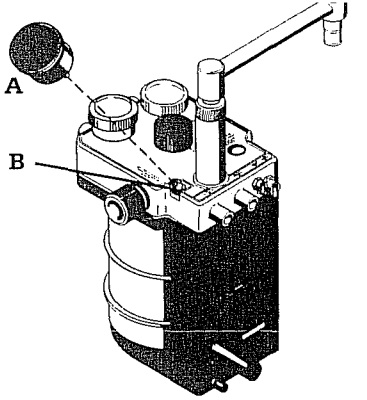
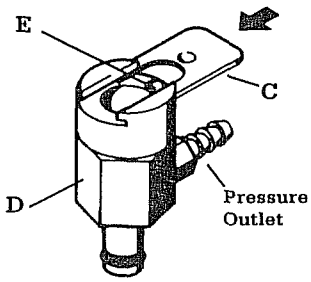

Sensing Tube
Note: Pressure Outlet is pointed up.
Inspiration Limb
Bacteria Filter
Recommended Location of Patient Circuit Adapter (Part Number 6050-0000-456)

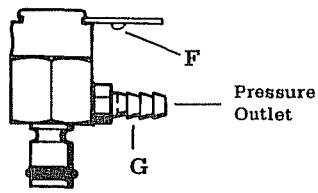
Figure 4-4

1. Remove the GMS pressure gauge.

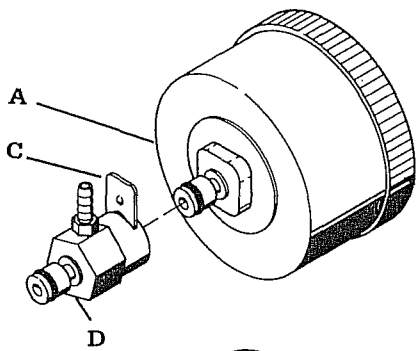


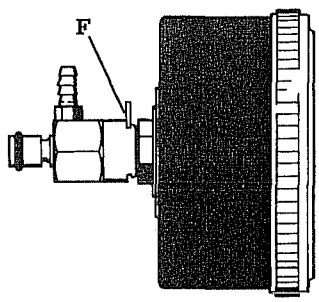
2. Insert the clip into the pressure gauge coupling.



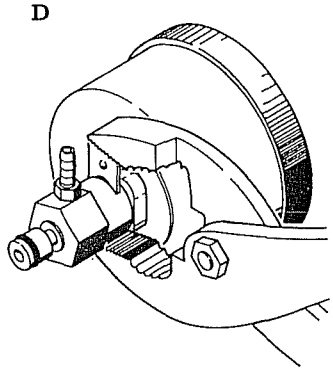


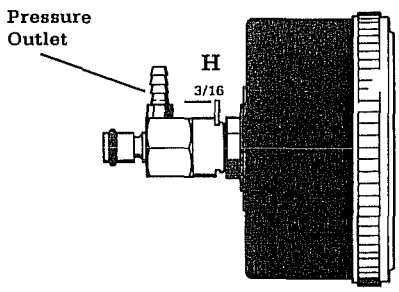
3. Join the pressure gauge and coupling.





4. Seat the pressure gauge coupling.





5. Attach tubing.

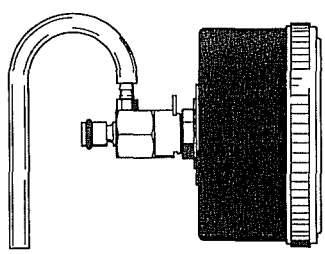


Figure 4-5
GMS Pressure Gauge Coupling Installation

4.4 Flow Sensor Connection

WARNING: The Minute Volume and Tidal Volume alarms are usable only if the TVX Flow cartridge is installed in the correct section of the breathing circuit. Operate the 5250 RGM only with the TVX flow cartridge placed in the expiratory limb or common airway of the breathing circuit. If the flow sensor is placed in the inspiratory limb, the monitor will not provide exhaled volume data.

WARNING: If the 5250 RGM is used with a hanging bellows type anesthesia ventilator, the monitor may register volumes in spite of circuit disconnection.

WARNING: Water in the TVX flow cartridge will restrict the motion of its internal vanes and cause erroneous tidal volume and minute volume readings. Position the tubing so that water drains away from the cartridge and does not accumulate in it.

WARNING: Exposure of the sensor clip to a direct beam of light may cause erroneous tidal volume and minute volume readings. Shield the sensor clip with opaque material if the reading is suspect.

A. Proximal Sensor Mounting

The flow sensor performs well when the sensor is mounted proximally; however, accuracy is optimized when the sensor is mounted distally.

Refer to Figure 4-6.

1. Install the cartridge with the sensor clip (A) attached between the inhaler Y connection (B) and the endotracheal tube adapter (C).
2. Check the orientation of the sensor clip on the cartridge. The clip is marked with arrows to indicate the proper air flow direction through the cartridge. When correctly installed, the arrows on the clip point away from the patient and toward the inhaler Y connection.

WARNING: The flow sensor must be correctly oriented in the breathing circuit as indicated by the markings on the sensor clip. The arrows should point away from the patient. If the clip is not mounted correctly, the volume monitor will not operate properly.

In order to minimize interference from cords and tubes, some operators prefer to have the sensor clip disconnected from the transducer cartridge during intubation of a patient as shown in Figure 4-7. The clip (A), with its attached cord, can be unsnapped from the cartridge (B) and placed out of the way. When the operator is ready, the clip can be snapped back onto the cartridge to resume monitoring.

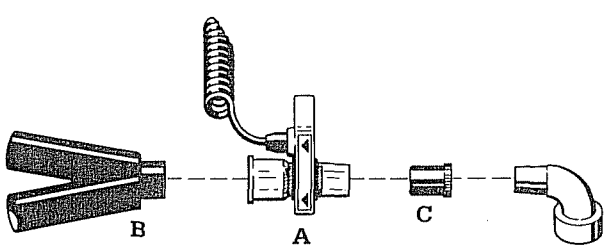


Figure 4-6
Flow Sensor Connection

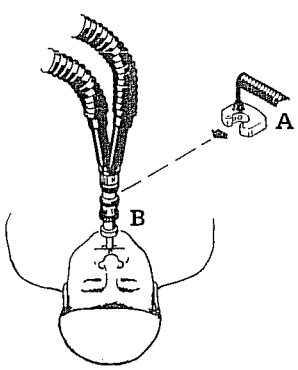


Figure 4-7

B. Distal Sensor Mounting

The flow sensor performs best when the sensor assembly is mounted distally, and tidal volume accuracy is optimized in the distal location. Another advantage of distal placement is that the RGM may detect back flows through the exhalation check valve location; the sensor is also less likely to come in contact with patient mucus at this site.

WARNING: Distal Mounting: When placing the TVX flow cartridge on the absorber valve, be certain to obtain a secure fit, but do not force the cartridge in place as tightly as possible. Because the sensor cartridge is tapered, a secure fit can be achieved without excessive force.

A properly placed cartridge is removable by hand, but it is advisable that a tool (pliers or channel lock pliers) be available to remove the cartridge in case it has been jammed on too tightly.

Before every use, ensure that the TVX flow cartridge is operational and easily removable.

Refer to Figure 4-8.

1. Install the cartridge, with the sensor clip (A) attached between the exhalation check valve (B) and the expiratory limb (C) from the inhaler Y connection.
2. The sensor clip is marked with arrows to indicate the correct airflow direction through the cartridge. Be sure the clip is correctly installed with the arrows pointing TOWARD the exhalation check valve and AWAY from the patient.

WARNING: The flow sensor must be correctly oriented in the breathing circuit as indicated by the markings on the sensor clip. The arrows should point away from the patient. If the clip is not mounted correctly, the volume monitor will not operate properly.

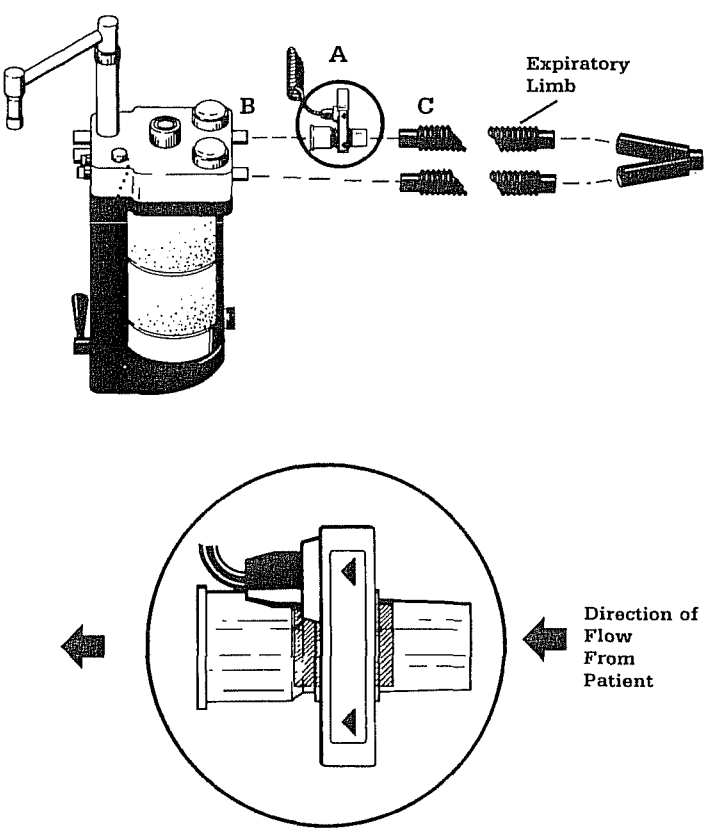


Figure 4-8
Proper Sensor and Clip Positioning in Distal Mounting

4.5 Patient Circuit Oxygen Sensor Connection

WARNING: The circuit O_2 display and alarms are only usable if enabled on the Setup Screen and a calibrated circuit O_2 sensor is installed. The RGM must be calibrated for the currently installed O_2 sensor.

CAUTION: Avoid storing O_2 sensors outside the following range: 0° to 26° C (32° to 80° F). O_2 sensors must have shorting clips or be connected to the monitor when in storage or not in use.

WARNING: Keep the circuit O_2 sensor attached to the unit to assure accuracy of O_2 readings. If detached, the sensor must be reattached and stabilized for an equivalent length of time (up to a maximum of 14 hours) before recalibrating.

Insert the oxygen probe into the gas stream to be monitored: either directly into the manifold of a GMS absorber, in the inspiratory limb of the patient circuit via the 22-mm tee manifold supplied with the monitor, or using the Dome Adapter Kit for the inhalation check valve of an Ohmeda (Ohio) Absorber.

Use the following procedure to mount the oxygen probe in the inspiratory limb.

1. Insert the adapter between the patient circuit and the outlet of the CO_2 absorber.
2. Insert the oxygen sensor probe into the 15-mm port. Mount the sensor vertically with the sensor opening facing down and the cord end facing up.

   CAUTION: When in use, the circuit O_2 sensor should always be facing downward to reduce moisture buildup on its sensing surface.

3. Insert the oxygen sensor plug into the O_2 connector on the back panel of the monitor.

   WARNING: Do not insert the circuit O_2 plug into the flow sensor connector on the back of the machine. Damage to the monitor could result.

4. Switch the monitor on and allow it to warm up for five minutes.
5. The alarm limits are preset. If you want to reset the alarm limits refer to Section 2.7.
6. Calibrate the patient circuit O_2 probe. Refer to Section 3.2.

Notes about Application

When the oxygen sensor is used in the patient circuit of a ventilator or an anesthesia gas machine, water vapor will condense on the surface of the sensor if the sensor's temperature is lower than or equal to the dew point temperature of the breathing gas. The condensate acts as an additional diffusion resistance and may result in a lower than actual O_2 concentration display, because of slower response times.

CAUTION: When in use, the circuit O_2 sensor should always be facing downward to reduce moisture buildup on its sensing surface.

In the patient circuit of a ventilator, place the sensor ahead of the breathing gas humidifier.

Continuous exposure of the oxygen sensor to CO_2 gas mixture can reduce the service life of the oxygen sensor (ACCURACY OF READINGS IS NOT AFFECTED). The service life of the sensor is 5000 percent hours - CO_2. Using the sensor in a gas mixture containing 1% CO_2 for five hours would reduce the service life of the sensor by 0.1%. However, since the sensor should preferably be located in the inspiratory section of the patient circuit, service life reduction as a result of CO_2 is minimal.

Note: The oxygen monitor provides information about the presence of oxygen at the point of sensing. This is not necessarily the same percentage that is present throughout the patient circuit.

5.1 Preoperative Checkout Procedure

WARNING: Perform the checkout procedure in Section 5.1 before using the monitor with a patient. If the monitor fails any test, it must be removed from use until it has been repaired and checked for correct operation.

This procedure assumes the user is familiar with the controls, the displays, and the alarms generated by the monitor.

1. Inspect all of the accessories of the 5250 RGM for damage. Replace broken or damaged accessories with Ohmeda replacement accessories.
2. Inspect the exterior of the 5250 RGM for damage. Check all the connectors and controls. Replace broken or damaged parts with Ohmeda replacement parts.
3. Depress the Display Release latch to slide the display panel to the right and empty the fluid collection bottle.
4. Check that all patient connections are made.
5. Switch on the monitor and allow it to warm up for five minutes.
6. During powerup the monitor performs several internal checks. The alarm tone should sound and the red and yellow LEDs will flash. If a problem exists, an alarm message appears. Refer to "Troubleshooting Guide" Section 8.2 for a description of the alarm messages.
7. Perform the calibration procedure for Zero and Span (Section 3.1 C.).

5.2 Monitor Operation

WARNING: Do NOT use the 5250 RGM in the presence of flammable anesthetics.

WARNING: Do not block airflow from the air intake or exhaust vents. Inaccurate readings and/or damage to the RGM may result. Do not place the RGM on surfaces with above ambient temperatures.

Important: To use the 5250 RGM effectively:

- Be familiar with the RGM's controls and connectors (see Sections 2.2 and 2.3).
- Understand the monitor's alarms and messages (see Section 2.4).

The 5250 RGM uses a software-driven menu control system. The screen has touch-sensitive features that control the operation of the RGM. Touching the option on the screen activates the selection. The display screen has four options that control the setup and operation of the RGM: Alarm Silence, LIMITS, MENU, and WAVE.

Before using the monitor with a patient, become familiar with the operation of the RGM. Refer to Sections 1 through 4 in this manual.

1. Before using this monitor on a patient, perform the checkout procedure in this Section.

   WARNING: Do not operate the 5250 RGM unless it is properly calibrated. Inaccurate patient parameter readings will result.

2. Connect the power cord to the RGM and the outlet. Check that the local voltage matches the voltage selector setting on the monitor.
3. Make the proper patient and RGM connections (see Section 4).
4. Switch on the RGM. The RGM performs a self-test procedure during powerup. If a problem exists, a message appears on the screen. Refer to "Troubleshooting Guide" Section 8.2 if a powerup failure occurs.
5. The configuration settings are preselected. To check or change the preselected configuration settings, refer to Section 2.5.
6. The waveforms and scale displays are preselected. Refer to Section 2.6 to reselect the waveforms and scales.
7. The alarm limits are preselected as listed in Section 2.4. To check or change the preselected alarm settings refer to Section 2.7.
8. Begin monitoring.

C. Optional Oximeter Probes for RGMs with SpO_2 Option Installed

Refer to the Ohmeda Probes Manual, part number 0380-0900-085, for various Ohmeda probes that can be used with the RGM.

D. Upgrade Options

Software Upgrade Kit 6050-0001-460

Note: The following options must be installed by an authorized Ohmeda representative.

Anesthetic Agent Upgrade Kit 6050-0001-174
SpO_2 Oximeter Upgrade Kit 6050-0001-220
5250 Membrane Separator Upgrade Kit 6050-0001-868

6.2. Specifications

Note: All specifications are based at sea level and subject to change without notice.

A. Basic Monitor

Measured Parameter	Displayed Parameter	Range	Accuracy	*Response Time	Resolution
CO_2	Waveform Et CO_2 Fi CO_2	**0-15%	±.3% CO_2 (0-9.9%) ±1.0% CO_2 (10-15%) for Resp. Rate 0-40	**200 msec	.1%
	Resp. Rate	2-90 bpm	±2 bpm		1 bpm
N_2O	Mean N_2O	0 - 100%	±2.0% N_2O (0-60%) ±5.0% N_2O (60-80%)	550 msec	1%
O_2	Fi O_2	0 - 100%	±3.0% O_2 (<60%) ±5.0% O_2 (≥60%)	20-60 seconds	1%
O_2 Circuit	Ckt O_2	0 - 100%	±3.0% O_2	20 seconds	1%
Flow	Tidal Volume	Pediatric Minimum flow of 5 LPM in breath		May take up to 1 minute to adjust to new patient then	
		50-200 mL Adult Minimum flow of 8 LPM in breath	±40mL	every breath	5mL
		80-200mL 200-800mL 800-2500	±40mL ±10% or 40mL ±10%		5mL 10mL 50mL
	Minute Volume	0-50.0 L	Sum of tidal volumes for last minute	5 seconds or end of breath	.1L
	Waveform Bar graph	5-100 LPM	±10%	Sampling time 10 milliseconds settling time 1 second	.4 LPM on analog output
Pressure	Waveform	-20 -120 cm H_2O	±5 cm H_2O	50 msec	1 cm H_2O
	Mean	0 to 99 cm H_2O			

6.1 Accessories

A. Standard (All Configurations)

**Line cord, US/Canada (one)	0208-0943-300
* Power Cord, Italian	6030-0000-002
* Power Cord, Cont. European	6030-0000-004
* Power Cord, Australian	6030-0000-001
* Power Cord, British	6030-0000-003
Sample lines (package of 10)	6026-0000-009
**ET tube adapters, straight tee (package of 10)	6027-0000-019
**ET tube adapters, elbow (package of 10)	6027-0000-020
* ET tube adapter, straight tee metal ISO (one per package)	6050-0000-478
Pressure sense line tee	6027-0000-005
Pressure sensing tee adapter	6050-0000-456
Cable management clips	6032-0000-053
Tubing 1/8" ID x eight feet	6026-0000-014
Scavenger Adapter Kit, 19 mm tee M/F with 1/8" barb and 10' 1/8" tubing	0237-2124-870
Bench Cleaning Tube Kit (non-agent RGM only)	6050-0000-097
**Cal Gas Kit, (non-agent cal gas canister with cal bag)	6050-0001-386
**Cal Gas Kit, (agent cal gas canister with cal bag)	6050-0001-380
Cartridge, Filter (package of five)	6050-0001-379
Service Manual	6050-0001-056
Operation and Maintenance Manual	6050-0001-051
Probes Manual (with SpO_2 option)	0380-0900-085

B. Optional (All Configurations)

Sample lines (package of 100)	6026-0000-037
ET tube adapters, straight tee (package of 100)	6027-0000-073
ET tube adapters, elbow (package of 100)	6027-0000-072
Critical care adapters (package of five)	6027-0000-070
Critical care adapters (package of 10)	6027-0000-059
Critical care adapters (package of 100)	6027-0000-071
Pediatric/Neonatal adapters 3.0 mm (package of 10)	6027-0000-065
Replacement filters for critical care adapters (package of 10)	6027-0000-060
Auto zero sample scrubber	6050-0001-387
Fluid trap bottle with/label	6050-0000-847
Fluid trap O-rings	6016-0000-032
Pressure Sensing Installation Kit for Mod II	0236-6152-870
Flow sensor clip assembly	0237-2226-700
Flow transducer cartridge (package of 10)	0237-2228-870
Flow Sensor Extension Cord Kit	0237-2041-880
Patient Circuit O_2 Sensor Kit (cartridge not included)	0237-2030-700
O_2 in-airway tee adapter, 22 mm	6050-0001-222
O_2 tee adapter, 22 mm	0212-0763-100
Pressure tee adapter for GMS Absorber Manometer	0236-6152-870
Dome Adapter Kit	0236-0035-800
O_2 sensor cartridge	0237-2034-700
Sensor Extension Cord Kit, 6'	0237-2040-880
Nasal Cannula CO_2 sampling line (package of 10)	6002-0000-046
Sample tubes, dual lumen, 96" with male locking leur (package of 10) fitting for gas sample and 1/8" ID tubing for pressure sensor	6050-0001-219
Return Adapter Kit, sample exhaust to patient circuit tee, 22 mm M/F with 1/8" barb	6050-0000-002
Non-agent cal gas canister; 6% CO_2, 50% O_2, 44% N_2O	6016-0000-053
Agent cal gas canister; 6% CO_2, 4% halocarbon-22, 50% O_2, 40% N_2O	6016-0000-045
Cal Gas Kits, bulk pack (package of six non-agent cal gas kits)	6050-0001-646
Cal Gas Kits, bulk pack (package of six agent cal gas kits)	6050-0001-638
Fuse Kit, 100/120V and 220/240V	6050-0001-059
Cable, RS-232 Interface (Connection for ThinkJet printer or 78xx ventilator)	6050-0001-629
Display Mounting Bracket Kit, dovetail style, for Mod II Plus, and Excel	6050-0001-450
Display Mounting Bracket Kit, pole style, 3/4" to 1 1/8" diameter range	6050-0001-642
Cartridge filter, 25 pack	6050-0001-772
Cartridge filter, 50 pack	6050-0001-669

* Shipped with International units only.

**Not shipped with International units.

D. Compensation

- CO_2, N_2O, and O_2 for barometric pressure.
- CO_2 for O_2, and N_2O

E. Sample Flow Rate

- Sample flow rate = 190 ±40 mL/min

F. Environmental Characteristics

Operating:

Temperature	15 - 40°C
Humidity	0 - 95% RH, noncondensing
Pressure	500-800 torr

Storage:

Temperature	-30°C to +60°C
	(10-50°C for O_2 sensors)
Humidity	0 - 95% RH, noncondensing
Pressure	5 - 20 psia

G. Physical Characteristics

Main Chassis

Size: 12.4 in. wide x 7.5 in. high x 16 in. long

Weight: Less than 25 lbs

Power - Fuse Rating

100 Vac 50/60 Hz 1.0A ⊟ T1.5A/250 V

120 Vac 50/60 Hz 1.0A ⊟ T1.5A/250 V

220/240 Vac 50/60 Hz 0.5A ⊟ T1.0A/250 V

H. Alarms

Message	Category	Range	Default
ACX DECODE TASK FAIL	system failure alarm	na	na
ACX XMIT TASK FAIL	system failure alarm	na	na
AGENT DETECTED	single-tone emergency	na	>.8% halothane
ANALOG FAIL	system failure alarm	na	na
AUTO ZERO IN PROGRESS	silent advisory	na	na
CALIBRATE TASK FAIL	system failure alarm	na	na
CO2 APNEA	quiet emergency**	20-30 sec	30 sec
COMMUNICATIONS FAIL	system failure alarm	na	na
DEVICE OVERHEATED	advisory	na	na
DISPLAY CPU FAIL	system failure alarm	na	na
DISPLAY DECODE TASK FAIL	system failure alarm	na	na
DISPLAY DIAG TASK FAIL	system failure alarm	na	na
DISPLAY RAM FAIL	system failure alarm	na	na

Stability and Drift

Warm-up Time: 5 minutes

Thermal Drift:

CO_2	Zero	±0.2% CO_2 /10 °C
	Gain	±0.2% CO_2 /10 °C
N_2O	Zero	±0.4% N_2O /10 °C
	Gain	±0.2% N_2O /10 °C

Stability:

	Zero	±3.0% O_2 /24 hours
	Gain	±0.2% CO_2 /24 hours
		±2.0% O_2 /6 months

B. SpO_2 Option

SpO_2	Pleth Waveform	Has no units	
	SpO_2	50-100%	±2.1%(80-90)
	Pulse Rate	40-255 bpm	±2 bpm

C. Agent Option

Internal Pressure Range: 450 - 850 mmHg

Operating Temperature Range: 15 - 40°C

CO_2 :

Measuring Range:	**0 - 8%**	**8 - 10%**
Zero Drift:	±0.2% CO_2 /24 hr	unspecified
Gain Drift:	±0.2% CO_2 /24 hr	unspecified
Temperature Zero Drift:	±0.2% CO_2 /10 °C	unspecified
Temperature Gain Drift:	±0.2% CO_2 /10 °C	unspecified
Response Time:	≤400 ms @ 200 mL/min	unspecified
Linearity:	±0.3% CO_2	unspecified

N_2O:

Measuring Range:	**0 - 100%**
Zero Drift:	±2% N_2O/24 hr
Temperature Zero Drift:	±2% /10 °C
Temperature Gain Drift:	±3% /10 °C
Response Time:	≤400 ms @ 200 mL/min

Agent:

Measuring Range:	**0.0 - 5% Halothane, Enflurane, Isoflurane**
Gain Stability:	±0.4% Halothane/24 hr
Zero Drift:	±0.6% Halothane/24 hr
Linearity:	±0.2% Halothane
Temperature Zero Drift:	±0.6% Halothane/10 °C
Temperature Gain Drift:	±0.4% Halothane/10 °C
Response Time:	≤500 ms @ 200 ml/min

Message	Category	Range	Default
NO VACUUM	advisory	na	na
PNEUMATIC TASK FAIL	system failure alarm	na	na
PURGING	advisory	na	na
RECALIBRATE BAROMETER	advisory	na	na
RECALIBRATE CIRCUIT O_2	advisory	na	na
RECALIBRATE GAS ANALYZER	advisory	na	na
RECALIBRATE P_{AW}	advisory	na	na
REVERSE FLOW	warning	fixed	OFF
SAMPLE FILTER BLOCKED	advisory	na	na
SAMPLE LINE/FILTER BLOCK	advisory	na	<100 mL flow
WATER TRAP FULL, PUMP OFF	warning	na	na
SERIAL DEVICE ERROR	advisory	na	na
SERIAL TASK FAIL	system failure alarm	na	na
SERVICE TASK FAIL	system failure alarm	na	na
SET NEW AGENT LIMITS	silent advisory	na	na
SIGNAL CPU FAIL	system failure alarm	na	na
SIGNAL DECODE TASK FAIL	system failure alarm	na	na
SIGNAL DIAG TASK FAIL	system failure alarm	na	na
SIGNAL RAM FAIL	system failure alarm	na	na
SIGNAL ROM CHECKSUM FAIL	system failure alarm	na	na
SIGNAL TREND TASK FAIL	system failure alarm	na	na
SpO_2 INOPERATIVE	advisory	na	na
SpO2 INSUFFICENT LIGHT DETECTED	silent advisory	na	na
SpO_2 PROBE FAILURE	advisory	na	na
SpO_2 PROBE ID ERROR	advisory	na	na
SpO_2 PROBE OFF PATIENT	emergency***	na	na
SUB ATMOSPHERIC P_{AW}	emergency	fixed	-15 cm H_2O
TARGET CHECK TASK FAIL	system failure alarm	na	na
VENTILATOR COMM FAIL	silent advisory	na	na
VENT-CHECK GAS SUPPLY	advisory	na	na
VENT-CHECK O2 PROBE	advisory	na	na
VENT-HIGH CIRCUIT O2	emergency	Set on 78xx	na
VENT-HIGH PAW	emergency	Set on 78xx	na
VENT-HIGH SUSTAINED PAW	emergency	fixed	na
VENT-LOW CIRCUIT O2	emergency	Set on 78xx	na
VENT-LOW MINUTE VOLUME	warning	Set on 78xx	na
VENT-LOW PAW	emergency	Set on 78xx	na
VENT-REVERSE FLOW	warning	fixed	na
VENT-SUBATMOSPHERIC PAW	emergency	fixed	na
VENT-TIDAL VOLUME APNEA	quiet emergency**	na	na
VENT-TV APNEA ALARM OFF	advisory	na	na
VENT-VOLUME SENSOR FAIL	advisory	na	na
VENT-VOL MONITOR STANDBY	advisory	na	na

Message	Category	Range	Default
DISPLAY ROM CHECKSUM FAIL	system failure alarm	na	na
DISPLAY TASK FAIL	system failure alarm	na	na
DISPLAY TOUCH PANEL FAIL	system failure alarm	na	na
DISPLAY TREND TASK FAIL	system failure alarm	na	na
DISPLAY VIDEO RAM FAIL	system failure alarm	na	na
DISPLAY XMIT TASK FAIL	system failure alarm	na	na
EVENT TASK FAIL	system failure alarm	na	na
GAS ANALYZER INOPERATIVE	advisory	na	na
GAS ANALYZER SATURATED	warning	na	na
GAS ANALYZER WARM-UP	silent advisory	na	na
HIGH CIRCUIT O_2	warning	18-100%	OFF
HIGH Et CO2	emergency	0-15%	OFF
HIGH EXPIRED AGENT	emergency	0-15%	*
HIGH FiCO2	emergency	0-15%	OFF
HIGH INSPIRED AGENT	emergency	0-15%	*
HIGH INSPIRED O2	emergency	18-100%	OFF
HIGH MINUTE VOLUME	warning	.2-50.0 L	OFF
HIGH N2O	emergency	0-100%	80%
HIGH PAW	warning	0-120 cm H_2O	80 cm H_2O
HIGH PULSE RATE	warning	80-250 bpm	OFF
HIGH SpO_2	warning	70-99%	OFF
HIGH SUSTAINED Paw	emergency	10-30 cm H_2O	30 cm H_2O
HIGH TIDAL VOLUME	warning	50-2500 mL	OFF
INSUF LIGHT DETECTED	advisory	na	na
INTERFERENCE ON SpO_2	advisory	na	na
LOW CIRCUIT O2	emergency	18-100%	18%
LOW Et CO2	emergency	0-15%	OFF
LOW EXPIRED AGENT	emergency	0-10%	*
LOW INSPIRED AGENT	emergency	0-10%	*
LOW INSPIRED O2	emergency	18-100%	18%
LOW MINUTE VOLUME	warning	.2-50 L	OFF
LOW PULSE RATE	warning	40-150 bpm	OFF
LOW SpO2	emergency	50-100%	90%
LOW SUSTAINED P_{AW}	warning	-20 to 20 cm H_2O	OFF
LOW QUALITY SpO_2 SIGNAL	silent advisory	na	na
LOW TIDAL VOLUME	emergency	50-2500 mL	OFF
NO BREATH DATA	system failure alarm	na	na
NO FLOW	advisory	na	<100 mL flow
NO SpO_2 PROBE	silent advisory	na	na

* Default depends on agent selected. Refer to Anesthetic Agent display in Section 2.8.

Note: Fizzing will occur upon application. Do not inhale the resulting fumes.

2. After the oxide has been removed, clean the sensor assembly with a solution of liquid detergent (use cotton swab) until no residual vinegar odor is present.
3. Ensure that the assembly is thoroughly dry before reassembling with a new sensor cartridge.

Oxygen Sensor Cartridge

The sensor cartridge should not be cleaned or sterilized routinely. However, if it is necessary to do so, follow these recommendations.

Note: To avoid damaging the sensor cartridge handle it with care.

1. Remove salt deposits and dirt accumulation from the sensor with a cloth moistened in distilled water.
2. If required, isopropyl alcohol can be used in place of water.
3. Do NOT autoclave the sensor cartridge.
4. Do NOT cold sterilize (disinfect) the sensor cartridge.

Note: The sensor cartridge may be gas sterilized using an ethylene oxide mixture (low temperature method only).

CAUTION: After sterilization with ethylene oxide, the flow sensor should be quarantined in a well ventilated area to allow dissipation of residual ethylene oxide gas absorbed by the probe. Follow the sterilizer manufacturer's recommendations for specific aeration periods required.

C. Patient Flow Sensor

The only connection the RGM has with the patient breathing circuit is with the transducer cartridge. The cartridge MUST be snapped out of the sensor clip for cleaning or sterilization.

Only the cartridge can be sterilized using an accepted gas or liquid sterilization technique.

The transducer cartridge is a precision device containing jeweled bearings and is assembled to close tolerances. When handling the cartridge:

- Do not drop the cartridge.
- Be particularly careful to prevent any contaminants (such as hair) from ever entering the cartridge.

CAUTION: Never insert cleaning brushes or other foreign objects through the flow cartridge vanes. The precision movement may be damaged.

The cartridge should be replaced if it becomes clogged or obstructed.

If the cartridge is sterilized with liquid agents, allow it to stand until completely dry. Once dry, the cartridge is ready for use; it does not require lubrication.

CAUTION: Following flow cartridge sterilization with ethylene oxide, quarantine the cartridge in a well ventilated area to allow dissipation of residual ethylene oxide gas absorbed by the cartridge material. Follow the manufacturer's recommendations for specific aeration periods required. In some cases, aeration periods of seven days or more may be required.

The sensor clip can be cleaned with a cloth moistened in a mild liquid detergent solution (wetting agent). Isopropyl alcohol can be used if further cleaning is required.

CAUTION: Use the recommended cleaning solution sparingly; do not saturate or immerse the flow sensor clip.

7.3 Sterilizing the Sample Tube Assembly

The sample tube assembly is an expendable item. However, if required, the sample tube can be sterilized by following standard hospital procedures using either liquid or gas sterilization.

CAUTION: Follow the sterilizer manufacturer's recommendations concerning procedures and aeration periods.

7.4 Sterilizing the Patient Circuit Adapters

The standard patient circuit adapters and the optional patient circuit adapter with integral (replaceable) filter are expendable items. However, if required, the adapters can be sterilized by following standard hospital procedures: To sterilize the standard adapters, use either liquid or gas sterilization. To sterilize the optional adapter having the integral filter, remove and discard the filter. Sterilize the tee-piece adapter using a cold sterilant. After sterilization, replace the filter with a new one (see Section 6.1). If sterilization is not required, an occluded filter can be rinsed off and reused.

CAUTION: Follow the sterilizer manufacturer's recommendations concerning procedures and aeration periods.

7.1 Cleaning the Monitor

Ensure that the RGM is unplugged before cleaning and that the unit is completely dry before use.

CAUTION: Do NOT autoclave or pressure sterilize the 5250 RGM.

CAUTION: Do NOT gas sterilize the RGM.

CAUTION: Never immerse the RGM in liquid. The electronic circuitry can be short-circuited, causing permanent damage.

CAUTION: Use the cleaning solution sparingly. Do not saturate the RGM. Excessive solution can flow into the RGM causing damage to internal components.

The outer surface of the RGM can be cleaned with a soft cloth dampened in a mild soap and water solution or isopropyl alcohol (70%).

Do not touch, press, or rub the display panel with abrasive cleaning compounds, instruments, brushes, rough surface materials, or anything that can scratch the panel. Do not use organic solvents to clean the display panel. Use a cotton swab saturated with 70% isopropyl alcohol and gently wipe the panel.

7.2 Cleaning the Probes

A. SpO_2 Monitor Patient Probe

The ear probe, finger probe, and Flex II probe are the only surfaces of this monitor that come in contact with the patient. To clean the probes after each patient:

1. Disconnect the probe from the patient.
2. Disconnect the probe from the RGM.
3. Clean the probe with a soft cloth using a mild soap and water solution or an isopropyl alcohol (70%) swab.
4. Allow the probe to dry completely before using it.

CAUTION: Do NOT soak or immerse the 5250 RGM probes in any liquid.

CAUTION: Do NOT autoclave the 5250 RGM probes.

The probes, except the Flex II, can be gas sterilized using an ethylene oxide mixture at 48.9 to 54.4°C (120 to 130°F). Always follow the sterilizer manufacturer's recommendations for specific aeration periods required. The Flex II Probe should NOT be gas sterilized with ethylene oxide.

CAUTION: After sterilization with ethylene oxide, the probes should be quarantined in a well ventilated area to allow dissipation of residual ethylene oxide gas absorbed by the probe. Follow the sterilizer manufacturer's recommendations for specific aeration periods required.

Note: Information about the materials that compromise the probes is available upon request. Please contact Ohmeda at 1-800-652-2469 for assistance.

B. Patient Circuit Oxygen Monitor Probe

Oxygen Sensor Assembly (less cartridge) and Tee Manifold

Clean the sensor assembly and the sensor cartridge separately. To remove the sensor cartridge follow the instructions in Section 8.6.

In use, the front housing of the sensor probe and the sensor cartridge (screened surface) are the only parts of the sensor assembly that are exposed to the patient circuit.

1. Probe housing, rear half (includes cable assembly): The rear housing contains electrical contacts that do not require cleaning under normal use. If required, the rear probe housing and cable assembly can be wiped with a cloth moistened in disinfectant (cold sterilant).

   CAUTION: Do not immerse the rear housing in cleaning solution.

2. Probe housing, (front half only) and tee manifold: The front probe housing and the tee manifold can be gas sterilized using an ethylene oxide mixture (low temperature method only).

   CAUTION: Following sterilization of the patient circuit oxygen probe housing (front half only) or the tee manifold with ethylene oxide, quarantine parts to allow dissipation of residual ethylene oxide gas absorbed by the material. Follow the sterilizer manufacturer's recommendations for procedure and aeration period.

Oxygen Sensor Assembly (if cartridge has leaked its electrolyte)

The sensor cartridge contains a small amount of potassium hydroxide electrolyte. In rare cases, a defective cartridge may rupture allowing electrolyte to leak into the sensor housing. Before replacing the defective cartridge, the sensor assembly should be cleaned with white vinegar and liquid detergent as detailed below.

1. Using a cotton swab soaked in white vinegar (not cider), rub the oxides off of all affected surfaces in the sensor housing, especially from the contact pins and the circuit board to which the pins are attached. Several applications may be necessary.

5. Install the new scrubber assembly, reconnect the zero inlet tubing, and secure the scrubber in place with the Velcro[1] strap.
6. Replace the access panel.
7. Replace the display panel.

7.8 Cleaning the Sample Chamber (Non-agent RGMs Only)

CAUTION: Do not attempt to clean the sample chamber of an RGM with Agent. Cleaning may cause permanent damage to the sensor and void the warranty.

A gas sample is continuously drawn through the sample chamber of the photometer where the contents of the gas are analyzed. Infrared energy (light) is passed through the gas and the amount of energy absorbed is measured. If the sample gas contains contaminants, some can stick to the "windows" of the sample chamber reducing the overall level of the transmitted infrared energy.

To compensate for the reduced transmission, the monitor must be zeroed to establish a new baseline. If the monitor requires repeated zero adjustment, the sample chamber should be cleaned. Under adverse conditions and prolonged use the sample chamber can become contaminated to the point where Zero calibration cannot be achieved. Cleaning the chamber may restore the use of the chamber (several cleanings may be required).

1. Set the monitor's AC power switch to "O" (Off) and unplug the power cord.
2. Remove the monitor's display panel. The infrared photometer is directly behind the inside access panel.
3. Remove the two mounting screws for the inside access panel.
4. Loosen the knurled-knob thumb screw and rotate the photometer 90° forward and up.
5. Looking at the photometer, note the larger diameter hose on the bottom and the smaller diameter hose on the top. These hoses are attached to the sample chamber. Disconnect both monitor hoses from the fittings at the sample chamber.
6. Remove the sample chamber thumb screws and carefully remove the sample chamber.
7. Connect the cleaning tube (standard accessory) with the luer fitting to the large fitting on the sample chamber. Connect the thin tube to the small fitting on the sample chamber.
8. Place a suitable receptacle under the small open tube to catch the overflow of the injected cleaning solution.
9. To clean the sample chamber, first follow Procedure I. Then, if zero adjustment still cannot be made, a more thorough cleaning may be required as detailed in Procedure II.

Procedure I

a. Flush the chamber with warm soapy water using a syringe to fill the chamber as shown in Figure 7-3. Let it stand for five minutes.

CAUTION: Do not use a strong alkaline detergent to clean the sample chamber because alkaline detergent may corrode the aluminum casing.

b. Flush the chamber with distilled water. Let it stand for two minutes.

c. Flush the chamber with isopropyl alcohol. Let it stand for one minute.

d. Using a syringe, flush the chamber with air to clear out the cleaning solution. Repeat the flushing three to five times.

e. Place the sample chamber in position on the photometer and mount it with the thumb screws.

f. Release the photometer thumb screw and rotate the photometer 90° down to its normal position.

g. Tighten the photometer release thumb screw.

h. Replace the access panel and mount it with the two mounting screws.

i. Replace the monitor's display panel.

j. Reconnect the power cord.

k. Switch on the monitor.

l. Select MENU from the display screen.

m. Select CALIBRATE INTERNALS from the pop-up menu.

n. Allow the monitor to run for at least five minutes (without a sample tube attached to the Sample Inlet) to dry out the sample chamber. While in the calibrate mode, observe decreasing N_2O values as the cell dries and the monitor stabilizes.

7.5 Cleaning the Internal Filters

WARNING: The presence of nebulized agents in the sample gas, such as Mucomyst (Registered trademark of Bristol-Myers), may over extended periods of exposure, tend to obstruct internal RGM filters.

The monitor contains several filters that do not require regular maintenance. If, however, a clogged or contaminated filter is indicated (reduced flow), refer to the *5250 Service Manual* for instructions about replacing the filter.

7.6 Sample Filter Cartridge Replacement

Some units have a gas sample filter cartridge located above the fluid trap. Replace this filter cartridge when the advisory message SAMPLE FILTER BLOCKED appears in the alarm display area or when the CO_2 waveform response time is degraded. See Section 6.1 for the filter cartridge part number. To replace the cartridge:

1. Slide the display panel to the right.
2. Pull the cartridge straight out from the fluid trap assembly.
3. Place the new cartridge in position and slide it in until it seats properly.
4. Check for leaks by occluding the sample inlet and noting that the unit purges within five seconds.
5. Slide the display panel to the left until it latches.

7.7 Auto Zero Scrubber Replacement (Only RGMs with Agent)

The auto zero scrubber removes traces of CO_2 from room air used to zero the optical sensor. The scrubber, which uses soda lime, must be replaced at about one-year intervals. See Section 6.1 for the auto zero scrubber's part number.

To replace the scrubber:

1. Remove the display panel.
2. Remove the access panel.
3. Pull the Velcro[1] strap to release the scrubber.
4. Lift the scrubber out and disconnect the zero inlet tubing.

1. Registered trademark of Velcro USA Inc.

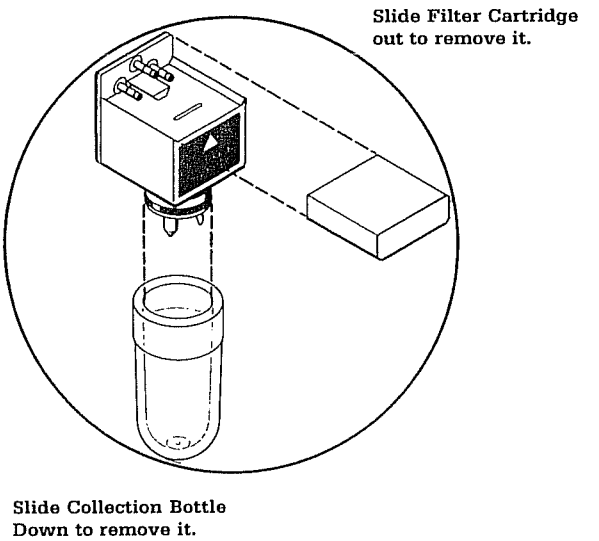


Figure 7-1
Sample Filter Cartridge Replacement

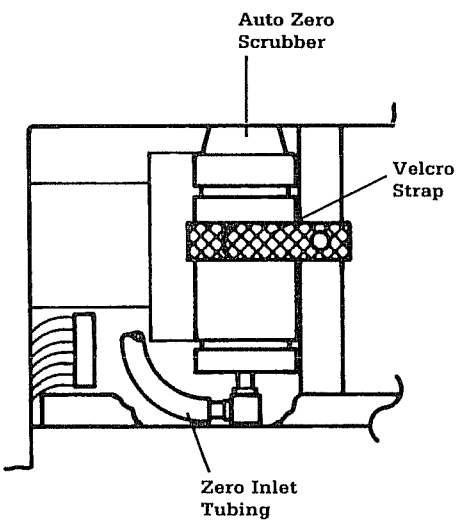


Figure 7-2
Auto Zero Scrubber Replacement
(Agent Version Only)

o. Select ZERO and observe the results. If zero cannot be set, further cleaning may be required as detailed in Procedure II.

p. If Zero can now be set, perform Span calibration as detailed in Section 3.1 C.

q. Perform the checkout procedure before returning the monitor to clinical use.

Procedure II

a. Prepare the monitor for further cleaning by repeating steps 1 through 8 of Section 7.8.

b. Using a syringe as before, fill the chamber with a mild detergent. Let it stand for 30 minutes.

CAUTION: Do not use a strong alkaline detergent to clean the sample chamber because alkaline detergent may corrode the aluminum casing.

c. After soaking, rinse the chamber several times with clean water.

d. Fill the chamber with isopropyl alcohol. Let it stand for 30 minutes.

e. Using a syringe, flush the chamber with air to clear out the cleaning solution. Repeat the flushing three to five times.

f. Reassemble the sample chamber and monitor for testing (steps e through n of Procedure I).

g. Select ZERO and observe the results. If Zero still cannot be set, the chamber may require replacement, or other service may be required as detailed in the *5250 Service Manual*.

h. If Zero can now be set, perform Span calibration as detailed in Section 3.1 C.

i. Perform the preoperative checkout procedure before returning the monitor to clinical use.

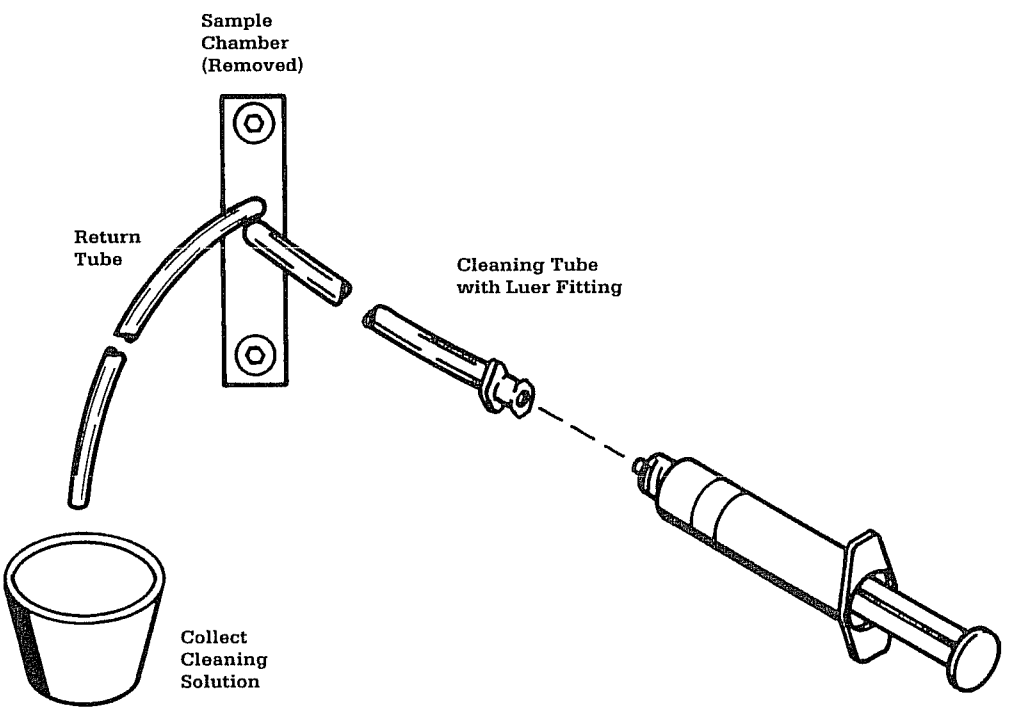


Figure 7-3
Cleaning the Sample Chamber (Non-agent RGM only)

Table 8.1 - Troubleshooting Guide

Symptom	Possible Cause	Recommended Action
RGM fails to respond when power is turned on.	The fuses may be open.	Refer to Section 8.3 for fuse replacement.
INVALID CO_2 ZERO INVALID N_2O ZERO INVALID CO_2 SPAN INVALID N_2O SPAN INVALID AGENT ZERO INVALID AGENT SPAN	Leak in calibration sampling system.	Check sample tube connections, ensure that calibration canister is not empty, and ensure that the cal gas reservoir bag has no leaks. Refer to Section 3.
Zero readings in calibrate mode drift and require frequent adjustment.	The sample chamber is contaminated or may be saturated with water.	Refer to Section 7.8.
If calibration of internal sensors results in INVALID O_2 ZERO or INVALID O_2 SPAN.	Leak in O_2 cell housing.	Tighten O_2 cell housing.
	O_2 cell not installed or O_2 cell reaching end of life cycle.	Refer to O_2 cell replacement Section 8.5.
If continuous LOW INSPIRED O_2 alarms occur.	O_2 cell not installed or O_2 cell reaching end of life cycle.	Refer to O_2 cell replacement Section 8.5.
If calibration of external sensors results in INVALID O_2 ZERO or INVALID O_2 SPAN.	Circuit O_2 cell or cable may not be installed, or O_2 cell may be at end of life cycle.	Ensure the circuit O_2 cable is plugged into the correct jack on the rear panel. Check the O_2 cell and refer to O_2 cell replacement in Section 8.6.
If continuous LOW CKT O_2 alarm occurs.	Circuit O_2 cell or cable may not be installed, or O_2 cell may be at end of life.	Ensure the circuit O_2 cable is plugged into the correct jack on the rear panel. Check the O_2 cell and refer to O_2 cell replacement in Section 8.6.
Monitor consistently shows lower CO_2.	Air leak in gas sample system or sample line blocked.	Ensure that the sample tube assembly is attached securely to the sample inlet connector. Do not overtighten the connection.
Frequent PURGING	Condensed moisture in sample line.	NONE: Monitor purging to clear sample line.
	Sample line occluded.	Check sample line for sharp bends or for a kinked line. If sample tube replacement is required, refer to Section 4.1.
Frequent purging followed by message SAMPLE LINE/FILTER BLOCK.	Purging system cannot clear blocked line.	Replace sample tube assembly and reset monitor as detailed in Section 4.1. If problem persists, remove monitor from use. Refer to Section 8.1 "Repair Policy".

8.1 Repair Policy

Warranty repair and service must be performed by an Ohmeda Service Representative or at the Ohmeda National Service Center at the address listed in this section. To contact an Ohmeda Service Representative call the nearest Ohmeda Regional Service Office listed on the back cover.

Do not use malfunctioning equipment. Make all necessary repairs or have the equipment repaired by an Ohmeda Service Representative. Parts listed in the *5250 Service Manual* may be repaired or replaced by a competent, trained person who has experience in repairing devices of this nature.

After repair, perform the checkout procedure (Section 5.1) to ensure that it is functioning properly, in accordance with the manufacturer's published specifications.

⚠ **WARNING: Do not remove the cover of the RGM. Refer servicing to qualified service personnel. Service personnel should disconnect the power cord before servicing the RGM.**

CAUTION: Only competent individuals trained in the repair of this equipment should attempt to service it.

CAUTION: Detailed information for more extensive repairs is included in the service manual solely for the convenience of users having proper knowledge, tools, and test equipment, and for service representatives trained by Ohmeda.

Contact the Ohmeda Technical Support Group listed on the back cover, for assistance.

Whether you send the unit for warranty service or nonwarranty service, package it securely for protection and ship it prepaid. Enclose the following items:

- A letter describing in detail any difficulties experienced with the unit
- Warranty information (when less than one year old) a copy of the invoice or other applicable documentation must be included
- Purchase order number to cover repair of a unit not under warranty
- Return address and billing address information
- Person (name and telephone number) to contact for functional questions.

Clean contaminated or dirty equipment before returning it to Ohmeda.

Address for warranty and nonwarranty repairs

USA
Attention: Service Center
Ohmeda Service and Distribution Center
7750 The Bluffs NW
Austell, GA 30001
800-999-6277

Canada
Canada Service Center
5865 McLaughlin Road
Mississauga Ontario L5R 1B8
416-568-9533

For repairs in areas other than USA or Canada, contact your regional sales/service office (see back cover).

Repairs will be made at Ohmeda's current list price for replacement parts plus a reasonable labor charge.

8.2 Troubleshooting Guide

There are no user serviceable parts within the 5250 RGM except the O_2 sensor (Section 8.5), sample chamber (Section 7.8), and auto zero scrubber (Section 7.7). Several components, however, can be accessed without removing the cover from the monitor. Replacing a defective component or making an adjustment as suggested in the following toubleshooting guide may restore a malfunctioning unit.

If the RGM fails to operate properly, verify that the monitor is set up as detailed in Section 5. Referring to Table 8.1, locate a symptom that best describes the apparent defect. Follow the recommended action to correct the possible cause of the failure.

If the malfunction cannot be corrected using the suggestions in this guide, further troubleshooting must be performed by a technically competent individual as described in the *5250 RGM Service Manual.*

Symptom	Possible Cause	Recommended Action
DISPLAY TOUCH PANEL FAIL DISPLAY TREND TASK FAIL DISPLAY VIDEO RAM FAIL DISPLAY XMIT TASK FAIL EVENT TASK FAIL NO BREATH DATA PNEUMATIC TASK FAIL SERIAL TASK FAIL SERVICE TASK FAIL SIGNAL CPU FAIL SIGNAL DECODE TASK FAIL SIGNAL DIAG TASK FAIL SIGNAL RAM FAIL SIGNAL ROM CHECKSUM FAIL SIGNAL TREND TASK FAIL TARGET CHECK TASK FAIL		
Display blank, the yellow alarm indicator is on, and the audible alarm sounds continuously.	System (monitor) failure.	Remove monitor from use. Refer to Section 8.1 "Repair Policy."
Display blank, the yellow alarm indicator is on, and/or the audible alarm sounds continuously.	System (monitor) display failure.	Remove monitor from use. Refer to Section 8.1 "Repair Policy."
SERIAL DEVICE ERROR or SERIAL DEVICE FAIL	Incorrect baud rate or data frame length/parity mismatch on RS-232 communication port.	See the Appendix to set baud rate/parity for correct communication of external computer with the monitor.

Symptom	Possible Cause	Recommended Action
SAMPLE FILTER BLOCKED.	The sample filter cartridge is occluded and must be replaced.	Replace patient sample filter cartridge above fluid trap.
NO VACUUM.	Significant internal pneumatics leak or pump failure.	Refer to "Repair Policy" Section 8.1.
NO FLOW.	The sample pump has failed.	Refer to "Repair Policy" Section 8.1.
DEVICE OVERHEATED.	The fan has failed or the ventilation holes are blocked.	Refer to "Repair Policy" Section 8.1.
REVERSE FLOW.	Exhalation valve may be stuck open.	Repair the exhalation valve.
WATER TRAP FULL PUMP OFF.	Water trap full.	Empty water trap.
GAS ANALYZER SATURATED.	Moisture in the measurement chamber.	Refer to the cleaning procedure in Section 7.
SpO_2 PROBE FAIL.	SpO_2 probe failure.	Replace the probe.
INTERFERENCE ON SpO_2.		Reapply the probe.
SpO_2 PROBE OFF PATIENT.		Reapply the probe.
SpO_2 INSUF LIGHT DETECTED.		Reapply the probe.
LOW QUALITY SpO_2 SIGNAL.		Reapply the probe.
NO SpO_2 PROBE.		Check probe connection.
SpO_2 PROBE ID ERROR.	The probe in use is not compatible.	Connect a compatible probe.
SpO_2 Inoperative.	SpO_2 circuits have failed.	Refer to "Repair Policy" Section 8.1.
DISPLAY TOUCH PANEL FAIL.	Touch panel not initialized properly. The unit was possibly powered on with an obstruction in the active touch panel area.	Ensure display bezel is clean and clear of obstruction, then cycle power off and on.
Constant occurrence of RECALIBRATE GAS ANALYZER, RECALIBRATE BAROMETER, RECALIBRATE P_{AW}, or RECALIBRATE CIRCUIT O_2 when unit is powered up.	Failure of battery to maintain internal calibration constants.	Contact service representative or consult *5250 Service Manual* to replace battery, refer to Section 8.1.
Any of these messages appears on the upper display: ACX DECODE TASK FAIL ACX XMIT TASK FAIL ANALOG FAIL CALIBRATE TASK FAIL COMMUNICATIONS FAIL DISPLAY CPU FAIL DISPLAY DECODE TASK FAIL DISPLAY DIAG TASK FAIL DISPLAY RAM FAIL DISPLAY ROM CHECKSUM FAIL DISPLAY TASK FAIL	System (monitor) failure alarm.	Remove monitor from use. Refer to Section 8.1 "Repair Policy and Procedure".

8.3 Fuse Replacement

Both lines of the monitor's AC power are fused. The fuses are inside the power input module, located on the back panel of the monitor. The power input module includes the power cord receptacle and the voltage selection drum.

To replace a fuse:

1. Switch off the monitor and remove the line cord from the monitor's power receptacle.
2. Note the voltage marking to the right of the receptacle. This marking should match the voltage available at the wall receptacle.
3. Using a small straight-blade screwdriver, pry open the cover of the power input module as shown in Figure 8-1.
4. Do not disturb the voltage selection drum. If it slips out of position, replace it so that the marked voltage noted in step 2 will be displayed through the cover when it is closed.
5. Note the direction of the arrow on the ends of the fuse holders (down). Slip the blade of the screwdriver behind the arrow and pull the fuse holder forward. Remove both fuse holders.
6. Remove the blown fuses and replace with same type and rating of fuse.

⚠ **WARNING: For continued protection against fire hazard, replace only with same type and rating of fuse.**

7. Orient the fuse holder with the arrow facing down and slip it back into the power input module.
8. Ensure that the voltage selection drum is properly seated in the module.
9. Close the cover of the module and snap it in place. Verify that the voltage marking matches the voltage available at the wall receptacle as noted in step 2.
10. Replace the power cord and test the monitor for proper operation.

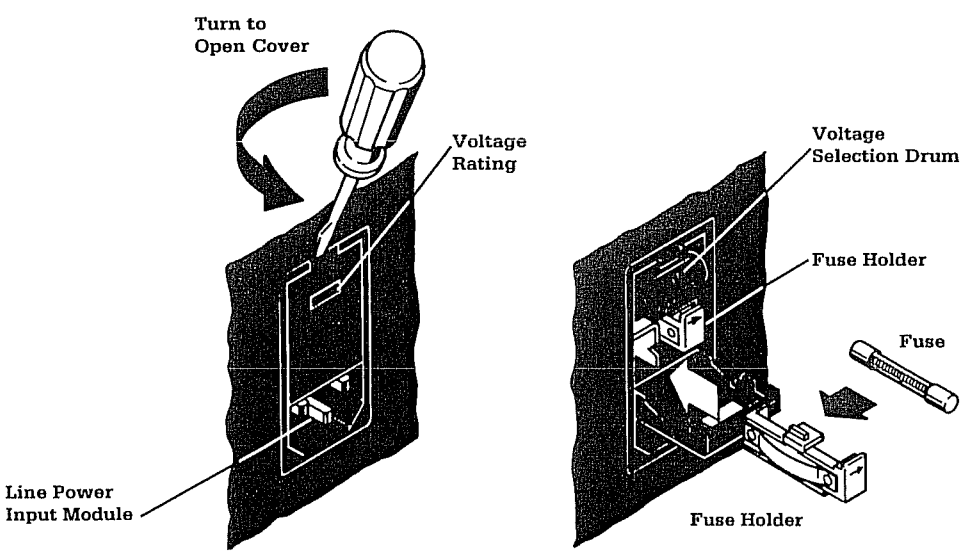


Figure 8-1
Fuse Replacement

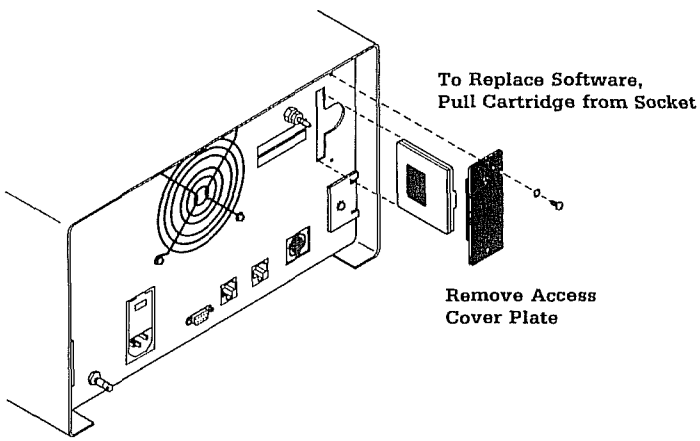


Figure 8-2
Signal Processing Software Replacement

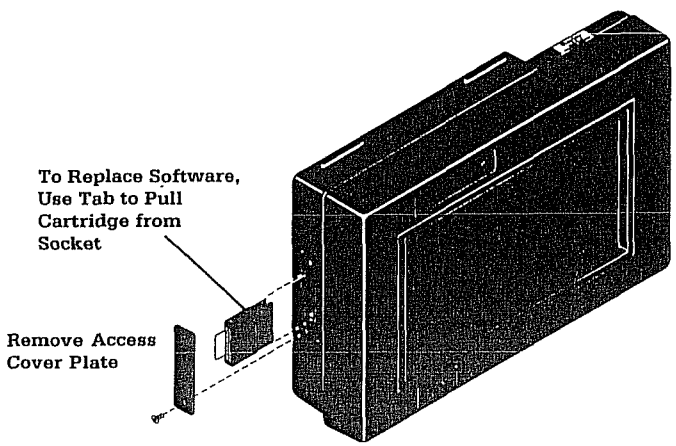


Figure 8-3
Display Processing Software Replacement

8.4 Software Replacement

A. Signal Processing Software Replacement

Refer to Figure 8-2

1. Switch off the monitor and disconnect the power cord.
2. Remove the two screws and the cover from the rear panel.
3. Grasp the installed software cartridge and pull away from the chassis.
4. Install the new software cartridge and replace the cover plate and mounting screws. Software cartridges are keyed to install only in one direction.

B. Display Processing Software Replacement

Refer to Figure 8-3

1. Switch off the monitor and disconnect the power cord.
2. Remove the two screws and the cover from the left side of the display.
3. Grasp the installed software cartridge and pull away from the display.
4. Install the new software cartridge and replace the cover plate and mounting screws.

8.5 Internal Oxygen Sensor Replacement

Refer to Figure 8-4

1. Disconect the power cord from the monitor.
2. Remove the display panel.
3. Remove the two mounting screws from the front access panel.
4. Disconnect the cable from the front of the O_2 sensor housing.
5. Turn the O_2 sensor housing counterclockwise and remove it.
6. Insert a new sensor in the housing with the circular copper conductors facing the front of the chassis.
7. Turn the cover housing clockwise until the cover is snug.
8. Reattach the O_2 sensor cable.
9. Remount the access door with the mounting screws.

CAUTION: After replacing the internal O_2 sensor, perform the calibration procedure in Section 3.1 to verify the RGM is working properly. Allow at least five minutes for the sensor to stabilize before calibrating.

8.6 Patient Circuit Oxygen Sensor Replacement

A. Sensor Assembly Replacement

Note: The sensor assembly consists of the housing (probe) for the oxygen sensor cartridge, the coiled cable, and the connector that joins the sensor assembly to the monitor. The sensor cartridge is not included in the replacement sensor assembly. It must be transferred from the old assembly, or a new cartridge must be installed.

The sensor assembly is attached to the monitor through a modular jack.

To disconnect the sensor assembly:

Push the release tab toward the cable and gently pull the connector (cable) from the monitor.

To connect the sensor assembly:

1. Align the cable connector with the modular jack (release tab down).
2. Gently push the connector into the jack. The release tab should snap into place.
3. Gently pull on the cable to verify a secure connection.

CAUTION: After replacing the probe assembly, perform the calibration procedure in Section 3.2 to verify that the RGM is working properly. Allow at least five minutes for the sensor to stabilize before calibrating.

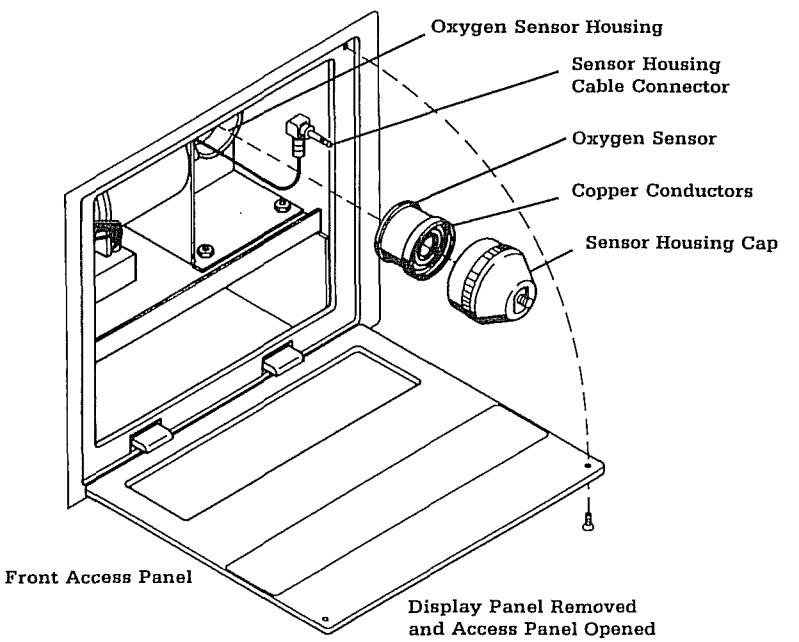


Figure 8-4
Internal Oxygen Sensor Replacement

B. How To Replace Sensor Cartridge

Refer to Figure 8-5.

The oxygen sensor cartridge is located inside the probe housing. Tools are not required to replace the sensor.

Note: To avoid damaging the sensor cartridge, handle it with care.

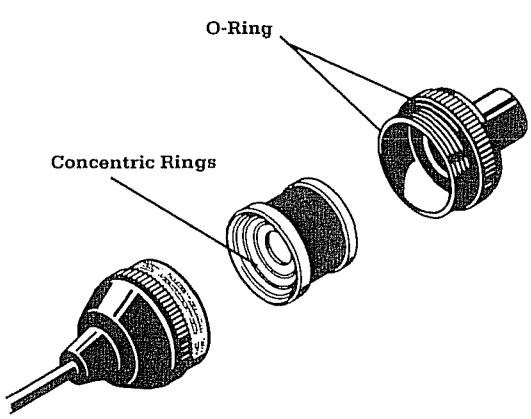
To remove the sensor cartridge:

1. Hold each half of the probe assembly at the knurled surfaces.
2. Unscrew the front housing half (the one without the cable attached) in a counterclockwise direction to open the housing.
3. Hold the rear housing with the cable connection down and spin off the front housing.
4. Note the appearance of the forward (exposed) surface of the sensor. This is the portion of the sensor that analyzes the oxygen concentration.
5. Lift the sensor out of the rear housing.

To replace the sensor module:

1. Hold the rear housing with the cable connection down.
2. Note the three gold-colored terminals in the rear housing. The sensor mates to these terminals through three concentric rings
3. Place the sensor into the rear housing. The rings must face into the housing to form an electrical contact with the terminals. The screened surface must face out to be exposed to the environment.
4. Thread the front housing into the rear housing to capture the sensor and hold it in place.
5. Turn the front housing clockwise until it "bottoms out."
6. Twist the housing halves further (finger tight) to compress the O-rings and to form a mechanical and gas tight seal.

CAUTION: After replacing the sensor cartridge, perform the O_2 sensor calibration in Section 3.2 to verify that the RGM is working properly. Allow at least five minutes for the sensor to stabilize before calibrating.



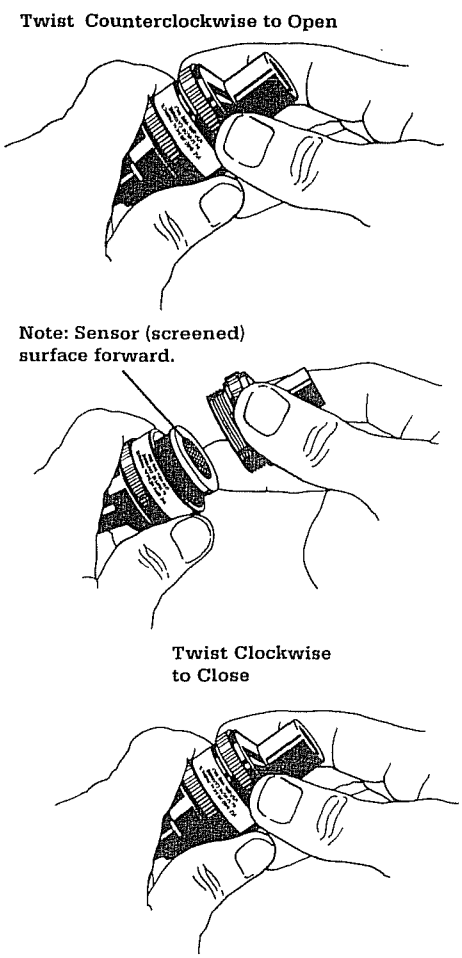


Figure 8-5

8.7 Flow Sensor Maintenance

A. Transducer Cartridge Replacement

When used regularly, the transducer cartridge should be replaced at least every 30 days. It should also be replaced if it becomes clogged or obstructed.

CAUTION: Never tamper with the set screws in the flow cartridge. Such action will render the cartridge unusable.

Refer to Figure 8-6

To replace a cartridge, first disconnect the sensor assembly (A) if it is installed in a patient breathing circuit (B).

Remove the used cartridge (C) from the sensor clip (D) and destroy it. Snap the sensor clip onto the replacement cartridge and replace the sensor assembly into the patient breathing circuit. The sensor clip arrows must point away from the patient end of the breathing circuit.

CAUTION: Malfunctioning flow cartridges must be destroyed to prevent their inadvertent use.

WARNING: The flow sensor must be correctly oriented in the breathing circuit as indicated by the markings on the sensor clip: the arrows should point away from the patient. If the clip is not mounted correctly, the 5250 Respiratory Gas Monitor will not operate properly.

B. Sensor Clip Replacement

If the Flow Sensor portion of the RGM does not provide the desired results and replacing the cartridge does not rectify the problem, try replacing the sensor clip. The sensor clip is a sealed unit. Do not open it for repair or cleaning; replace it as a unit.

To replace the sensor clip (A), unsnap it from the transducer cartridge (B) as shown in Figure 8-7. It is unnecessary to remove the cartridge from the breathing circuit.

Unplug the sensor clip's electrical connector from the RGM.

Snap the new sensor clip into position on the cartridge as shown in Figure 8-7. Be sure to orient the sensor clip in the correct direction for gas flow as indicated by the arrow direction. The sensor clip arrows must point away from the patient end of the breathing circuit.

WARNING: The flow sensor must be correctly oriented in the breathing circuit as indicated by the markings on the sensor clip. The arrows should point away from the patient. If the clip is not mounted correctly, the volume monitor will not operate properly.

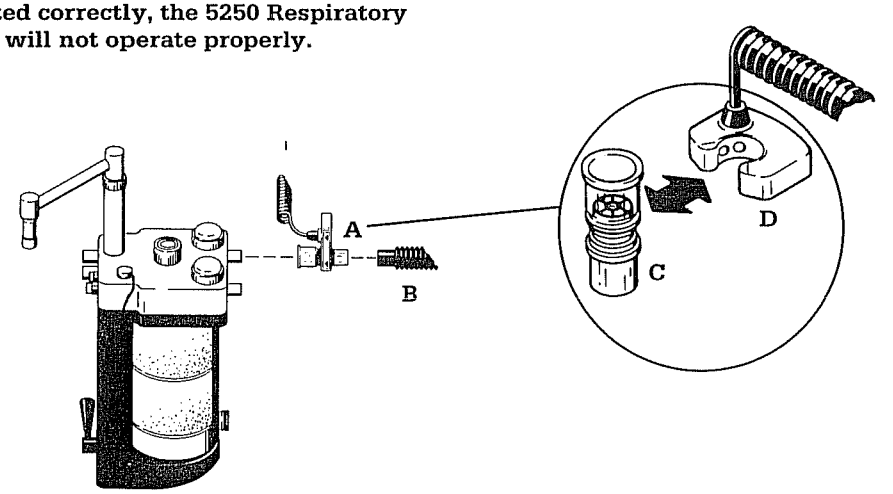


Figure 8-6
Transducer Cartridge Replacement

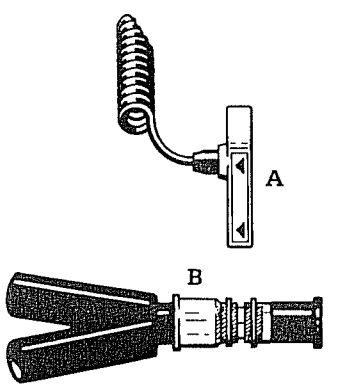


Figure 8-7
Sensor Clip Removal from the Breathing Circuit

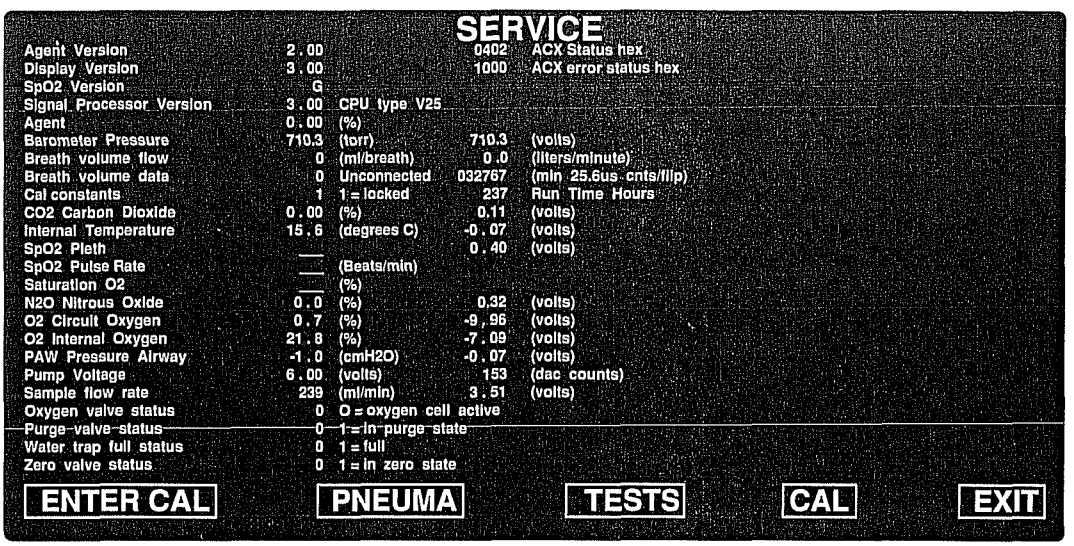
A. Barometric Pressure Check

1. Switch on the RGM and allow it to warm up for five minutes.
2. Select MENU from the display screen.
3. Select SETUP from the menu.
4. Select SERVICE MODE from the Setup Screen.
5. Select ON from the Setup Screen. The Service Screen appears. See Figure A-1.
6. Select PNEUMA from the Service Screen. See Figure A-2.
7. Select OFF from the Pneumatics Service Screen. This switches off the pump.
8. Check that the Barometric Pressure reading on the monitor is correct for your area. Compare the monitor barometric pressure reading to a calibrated absolute barometric pressure gauge.

   Note: Be sure that the true local barometric pressure used for comparison is NOT corrected to sea level.

   The Barometric Pressure reading should be within ±5 mmHg. If the Barometric Pressure reading requires adjustment refer to "Barometric Pressure Calibration" in the *Ohmeda 5250 Service Manual* or contact an Ohmeda Service Representative for your area.

Note: One torr is equivalent to one mmHg for this procedure.

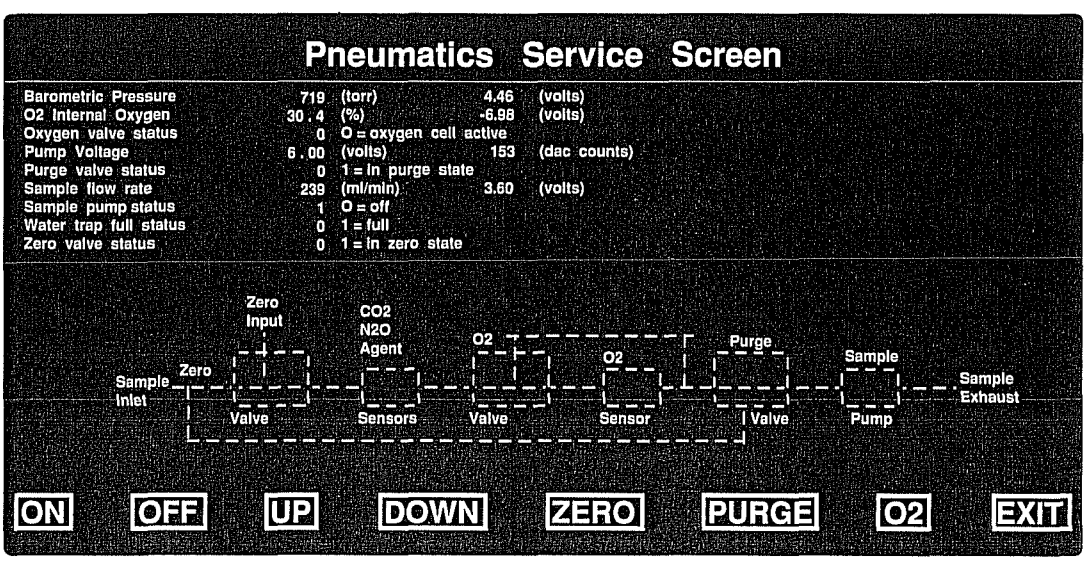

SERVICE
Agent Version 2.00 0402 ACX Status hex
Display Version 3.00 1000 ACX error status hex
SpO2 Version G
Signal Processor Version 3.00 CPU type V25
Agent 0.00 (%)
Barometer Pressure 710.3 (torr) 710.3 (volts)
Breath volume flow 0 (ml/breath) 0.0 (liters/minute)
Breath volume data 0 Unconnected 032767 (min 25.6us cnts/flip)
Cal constants 1 1 = locked 237 Run Time Hours
CO2 Carbon Dioxide 0.00 (%) 0.11 (volts)
Internal Temperature 15.6 (degrees C) -0.07 (volts)
SpO2 Pleth 0.40 (volts)
SpO2 Pulse Rate (Beats/min)
Saturation O2 (%)
N2O Nitrous Oxide 0.0 (%) 0.32 (volts)
O2 Circuit Oxygen 0.7 (%) -9.96 (volts)
O2 Internal Oxygen 21.8 (%) -7.09 (volts)
PAW Pressure Airway -1.0 (cmH2O) -0.07 (volts)
Pump Voltage 6.00 (volts) 153 (dac counts)
Sample flow rate 239 (ml/min) 3.51 (volts)
Oxygen valve status 0 O = oxygen cell active
Purge valve status 0 1 = in purge state
Water trap full status 0 1 = full
Zero valve status 0 1 = in zero state
ENTER CAL
PNEUMA
TESTS
CAL
EXIT

Icon	Functions
ENTER CAL	Special Service Cal Screen
PNEUMA	Pneumatics Service Screen
TESTS	Service Diagnostics Screen
CAL	Service CAL Screen
EXIT	Return to Monitoring Screen

Figure A-1
Service Screen

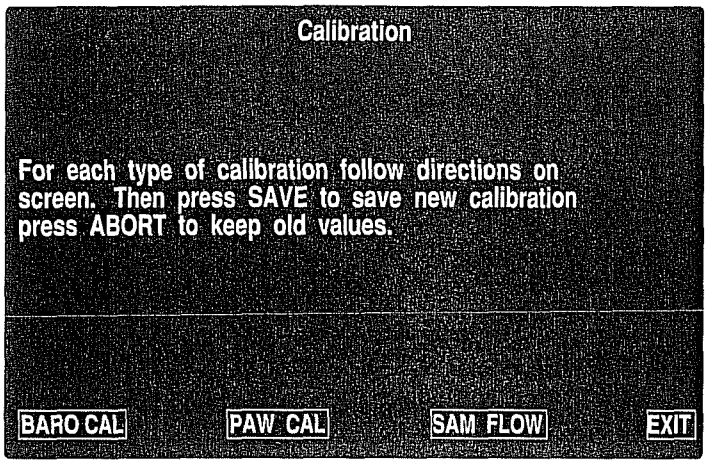
B. Barometric Pressure Calibration

See the *Ohmeda 5250 Service Manual* for instructions regarding barometric calibration.

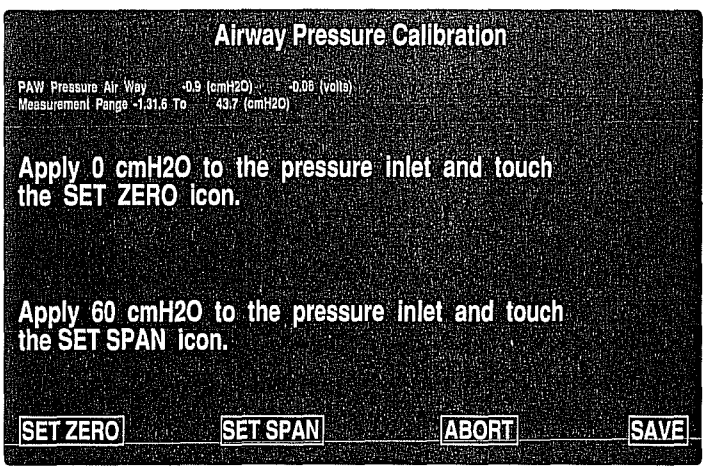


Options	Function
ON	Turns pump on
OFF	Turns pump off
UP	Raises pump voltage
DOWN	Lowers pump voltage
ZERO	Toggles zero valve
PURGE	Toggles purge valve
O2	Toggles O2 valve
EXIT	Returns to main service screen

Figure A-2


Calibration
For each type of calibration follow directions on screen. Then press SAVE to save new calibration press ABORT to keep old values.
BARO CAL
PAW CAL
SAM FLOW
EXIT

PAW CAL


Airway Pressure Calibration
PAW Pressure Air Way -0.9 (cmH2O) -0.08 (volts)
Measurement Range -1.31.6 To 43.7 (cmH2O)
Apply 0 cmH2O to the pressure inlet and touch the SET ZERO icon.
Apply 60 cmH2O to the pressure inlet and touch the SET SPAN icon.
SET ZERO
SET SPAN
ABORT
SAVE

SAM FLOW

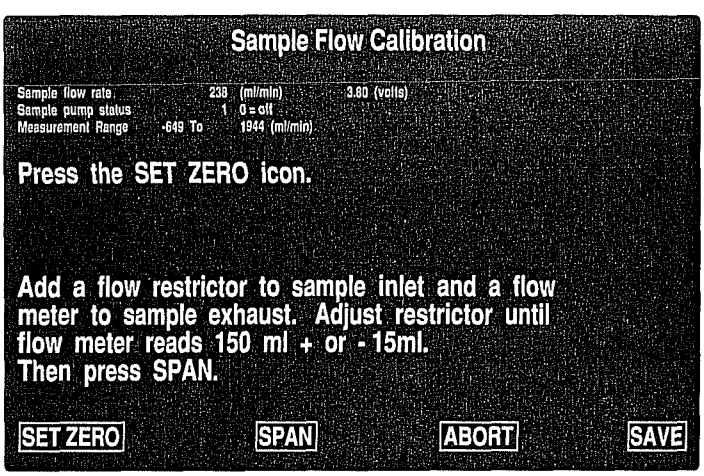

Sample Flow Calibration
Sample flow rate 238 (ml/min) 3.80 (volts)
Sample pump status 1 0 = off
Measurement Range -649 To 1944 (ml/min)
Press the SET ZERO icon.
Add a flow restrictor to sample inlet and a flow meter to sample exhaust. Adjust restrictor until flow meter reads 150 ml + or - 15ml.
Then press SPAN.
SET ZERO
SPAN
ABORT
SAVE

Figure A-3
Service Calibration Screens

C. Airway Pressure Calibration

Refer to Figure A-3.

1. Select CAL from the Service Screen. The Calibration Screen appears.
2. Select PAW CAL from the Calibration Screen. The Airway Pressure Calibration Screen appears. See Figure A3.
3. Connect a syringe and a pressure gauge to the P_{AW} inlet.

If a cm H_2O gauge is not available the following table provides equivalents in delta mmHg.

0 cm H_2O	=	0 delta mmHg
-10 cm H_2O	=	-7.4 delta mmHg
50 cm H_2O	=	36.8 delta mmHg
60 cm H_2O	=	44.1 delta mmHg
100 cm H_2O	=	73.6 delta mmHg

4. Open the pressure inlet and touch SET ZERO. The new value appears.
5. Apply 60 cm H_2O to the pressure inlet and touch SET SPAN. The new value apppears.
6. Expose the P_{AW} inlet to atmospheric pressure. The P_{AW} display should read 0 ±5 cm H_2O
7. Apply -10, 50, and 100 cm H_2O to the pressure inlet. The P_{AW} display should read within ±5 cm H_2O
8. Press SAVE to save the new calibration values or press ABORT to keep the old values.

D. Sample Flow Calibration

Refer to Figure A-3.

Sample flow should be recalibrated whenever the sample flow rate sensor is replaced.

1. Select CAL from the Service Screen. The Calibration Screen appears.
2. Select SAM FLOW from the Calibration Screen. The Sample Flow Calibration Screen appears. See Figure A-3.
3. Connect a calibrated flowmeter to the sample exhaust outlet on the back of the machine.
4. Press SET ZERO. The pump is automatically switched off. Wait for the ZERO CALIBRATION COMPLETE message to flash.
5. Measure the flow at the sample outlet with a flowmeter capable of reading 150 mL/min, such as the Ohmeda flowmeter, part number 6024-0000-006. Add a flow restrictor to the sample inlet. Adjust the flow until the flowmeter indicates 150 mL/min ±5 mL/min. (The Ohmeda flowmeter has an adjustable flow restriction for this purpose.) Then press SPAN.
6. After span calibration the flow reading on the Calibration Screen should be the same as the external flowmeter within ±15 mL/minute.
7. Press SAVE to save the new calibration values or press ABORT to keep the old values.
8. Press EXIT to return to the Service Screen.
9. Press EXIT to return to the RGM display screen.

E. Hardware Option Selection

An option selection switch on the signal processor must be set according to the hardware options installed. The signal processor board is the left most board inside the monitor, when viewed from the front. Only qualified service technicians should remove the cover of the monitor and inspect the switches. The switches are numbered starting with the switch closest to the front of the monitor.

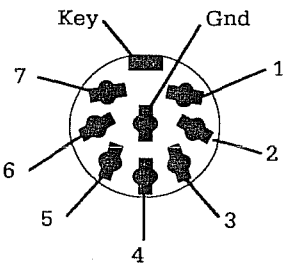
Signal Processor Dip Switch Settings:

Switch #	Position	Function
1	Open /left	SpO_2 option installed
	Closed /right	No SpO_2 option installed
2	Not used	
3	Open /left	Calibration constants locked
	Closed /right	Calibration constants unlocked
4	Not used	

F. Analog Outputs

CAUTION: Maximum voltage. No more than 5 volts should appear on any pin of the analog ouput connector.

Connector Pinouts



Channel Assignments

Channel		Scale
1	CO_2 Waveform	66.6 mV/%
2	N_2O Waveform	10 mV/%
3	P_{AW} Waveform	(V*140)-20 = cm H_2O
4	Flow Waveform	10 mV = 1 L/min
5	SpO_2 [1] or Agent Waveform[2]	10 mV/% 66.6 mV/%
6	O_2 Inspired/Expired	10 mV/%
7	CO_2 Expired	66.6 mV/%

1 For RGM without Agent
2 For RGM with Agent

The analog output accuracy is ±3.5% (absolute), linearity ±.5%, with an update rate of 10 milliseconds and a resolution of 3.9 mV.

Note: Output source impedance 100 ohms.

Strip Chart Calibration

1. Select MENU, SETUP, VIEW ALL, and REC CAL.
2. Connect the Strip Chart recorder to the analog output connector. Pinout of the connector is shown in this section.
3. Select ZERO. All channels will be set to zero volts. Adjust the strip chart recorder.
4. Select ONE. All channels will be set to one volt (full scale). Adjust the strip chart recorder.
5. Press EXIT three times to return to the display screen.

G. RS-232 Communications

The following data will be output to the RS-232 port at the configured time interval. At the top of each page the following title will be output with 58 lines of data formatted under each column. Data communication is at 1200 baud, odd parity, 7 bits per character, 1 stop bit or 9600 baud, no parity, 1 stop bit, depending on setup configured for RS-232 device.

<ff>

:RG*	CO_2			O_2		P_{AW}			FLOW			CKT	Bar	Sp		Agent		X		
:RG*	I	E	RR	I	E	I	E	M	TV	MV	N_2O	O_2	Pre	O_2	PR	I	E	<cr>		
:RG	xx.x	xx.x	xxx	xxx	xxx	xxx	xxx	xxx	xxxx	xx.x	xxx	xxx	xxx	xxx	xxx	xx.x	xx.x	<cr>		

Value indexes:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

*These channel labels are printed at the top of each page.

1. CO_2 Inspired in %
2. CO_2 Expired in %
3. CO_2 Respiratory Rate in breaths per minute
4. O_2 Inspired in %
5. O_2 Expired in %
6. PAW Inspired in cm H_2O
7. PAW Expired in cm H_2O
8. PAW Mean in cm H_2O
9. Tidal volume in milliliters
10. Minute volume in liters
11. Nitrous N_2O in %
12. Patient Circuit O_2 in %
13. Barometric pressure in torr in sample chamber. Can be used to convert CO_2 to mmHg if desired. CO_2 mmHg = CO_2 % * Barometric pressure /100. CO_2 kPa = CO_2 mmHg /7.5
14. SpO_2 %. Only output if option installed.
15. SpO_2 pulse rate in beats per minute from SpO_2 board. Only output if option is installed.
16. Agent Inspired in %. Title line will change to indicate type of agent configured. "H" indicates halothane, "I" indicates isoflurane, "E" indicates enflurane, and "N" indicates no agent. Only output if agent option is installed.
17. Agent Expired in (%). Only output if agent option is installed.

Connector Pinout, Type DB-9.

Pin	Function
2	Transmitted data from monitor
3	Received data into monitor
7	Ground
9	External alarm silence

H. 78xx Ventilator Interface

The 78xx ventilator performs all calculations for TV, MV, PAW, and Circuit O_2 values. An RS-232 cable is used to transmit these values to the RGM, which displays the values received from the 78xx ventilator. The calculations for PAW values by the ventilator differ from those of the RGM: Mean as calculated by the RGM is changed to PLAT as calculated by the 78xx ventilator. An algorithm similar to the one used by the RGM is used by the 78xx ventilator for MAX and MIN PAW values.

If an alarm associated with a value on the screen flashes, press alarm silence on the RGM to silence the alarm. If the ventilator is interfaced, the alarm silence period is 30 seconds.

Alarm limit settings and the display for TV, MV, PAW, and Circuit O_2 values are set on the ventilator.

To interface the RGM to 78xx ventilator:

1. Obtain the cable assembly RS-232 Ohmeda part number 6050-0001-629 (RGM to HP Thinkjet or 78xx ventilator).
2. Connect one end of the cable to the ventilator and the other to the RGM.
3. On the Setup Screen select RS-232 device and select 78xx VENT.

The RGM will immediately dash (---) PAW, TV, MV, and O2 vent values until communications with the ventilator is established.

If the cable is disconnected or the ventilator is powered off, the RGM will dash (---) the PAW, TV, MV, and O2 vent values after 12 seconds and display the VENTILATOR COMM FAIL message in the alarm window on the RGM.

The RGM will display and sound ventilator parameter alarms for TV, MV, PAW, and Circuit O_2. Other patient safety alarms will sound only on the ventilator.

This Product is sold by Ohmeda under the warranties set forth in the following paragraphs. Such warranties are extended only with respect to the purchase of this Product directly from Ohmeda or Ohmeda's Authorized Dealers as new merchandise and are extended to the first Buyer thereof, other than for purpose of resale.

For a period of twelve (12) months from the date of original delivery to Buyer or to Buyer's order, but in no event for a period of more than two years from the date of original delivery by Ohmeda to an Ohmeda Authorized Dealer, this Product, other than its expendable parts, is warranted to be free from functional defects in materials and workmanship and to conform to the description of the Product contained in this operation manual and accompanying labels and/or inserts, provided that the same is properly operated under conditions of normal use, that regular periodic maintenance and service is performed and that replacements and repairs are made in accordance with the instructions provided. This same warranty is made for a period of thirty (30) days with respect to the expendable parts. The foregoing warranties shall not apply if the Product has been repaired other than by Ohmeda or in accordance with written instructions provided by Ohmeda, or altered by anyone other than Ohmeda, or if the Product has been subject to abuse, misuse, negligence, or accident.

Ohmeda's sole and exclusive obligation and Buyer's sole and exclusive remedy under the above warranties is limited to repairing or replacing, free of charge, at Ohmeda's option, a Product, which is telephonically reported to the nearest Ohmeda Regional Service Office and which, if so advised by Ohmeda, is thereafter returned with a statement of the observed deficiency, not later than seven (7) days after the expiration date of the applicable warranty, to the designated Ohmeda Regional Service Office during normal business hours, transportation charges prepaid, and which, upon Ohmeda's examination, is found not to conform with the above warranties. Ohmeda *shall not be otherwise liable for any damages including but not limited to incidental damages, consequential damages, or special damages.*

There are no express or implied warranties which extend beyond the warranties hereinabove set forth. Ohmeda *makes no warranty of merchantability or fitness for a particular purpose with respect to the product or parts thereof.*

Ohmeda
1315 West Century Drive
Louisville CO 80027 9560
USA
Telex 296 445 BTI UR

A Division of The BOC Group Inc

Regional Service Offices

Eastern Region
Ohmeda
Fort Lee Executive Park
One Executive Drive
Fort Lee NJ 07024
USA
Tel 800 922 0443
Tel 201 947 6100

Midwestern Region
Ohmeda
2101 S Arlington Heights Rd
Suite 145
Arlington Heights IL 60005
USA
Tel 800 372 5867
Tel 708 364 7090

Pacific Region
Ohmeda
5635 W Las Positas Blvd
Suite 406
Pleasanton CA 94588
USA
Tel 800 227 2054
Tel 415 463 2133

Southeastern Region
Ohmeda
4565 Winters Chapel Rd
Atlanta GA 30360
USA
Tel 800 241 4300
Tel 404 449 7990

Southwestern Region
Ohmeda
831 Greenview Drive
Grand Prairie TX 75050
USA
Tel 800 433 5070
Tel 800 772 5420

International

UK, Europe, Africa and
Middle East
Ohmeda
Ohmeda House
71 Great North Road
Hatfield AL95EN
Hertfordshire
England
Tel 707 263570
Fax 707 260065/707 260191
Telex 915128

Latin America, Caribbean
Ohmeda
10700 N Kendall Dr
Suite 301
Miami FL 33176
USA
Tel 305 596 0800
Fax 305 596 9216
Telex 441258/6812092

Southeast Asia
Ohmeda
78 Shenton Way
#09 03
Singapore 0207
Tel 65 222 6028
Fax 65 222 0725
Telex RS 35276

Service and Distribution Center

Ohmeda
7750 The Bluffs NW
Austell GA 30001
USA
Tel 800 999 6277
Tel 404 739 4774

Technical Support

Ohmeda
Ohmeda Drive
PO Box 7550
Madison WI 53707
USA
Tel 800 345 2700

Canada Service Centre

Ohmeda
5865 McLaughlin Road
Mississauga Ontario L5R 1B8
Canada
Tel 416 568 9533
Fax 416 568 9799

In the USA, please call Customer Service at 800 345 2700 for additional information or to place an order.

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